

The United States Drought Monitor Process: A Look Behind the Green Curtain

**Mark Svoboda, PhD, Director
National Drought Mitigation Center
University of Nebraska-Lincoln**

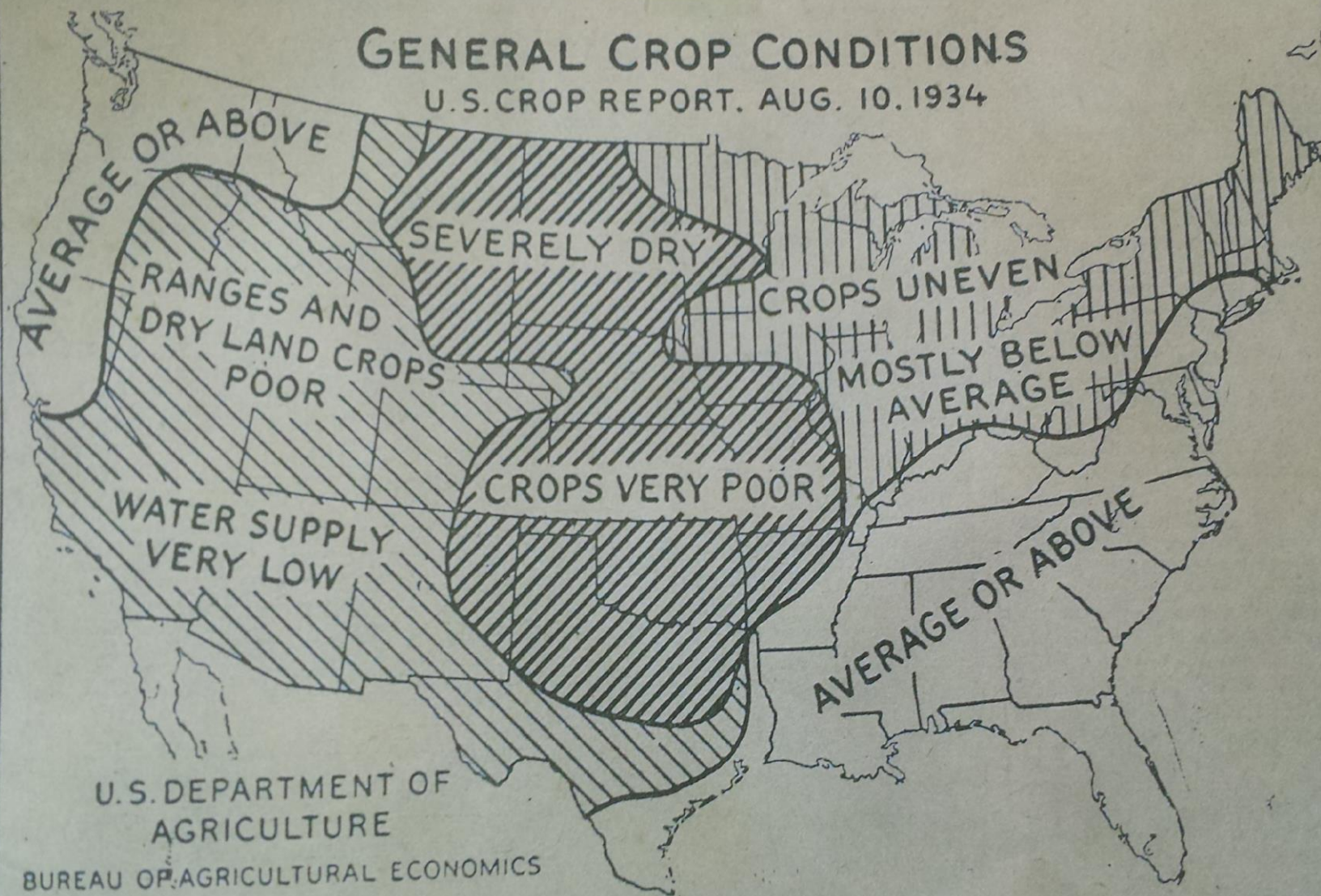


MAPP Webinar Series
April 27, 2018

CROP EXPERTS MAKE MAP OF DROUTH AREAS

GENERAL CROP CONDITIONS

U.S. CROP REPORT, AUG. 10, 1934

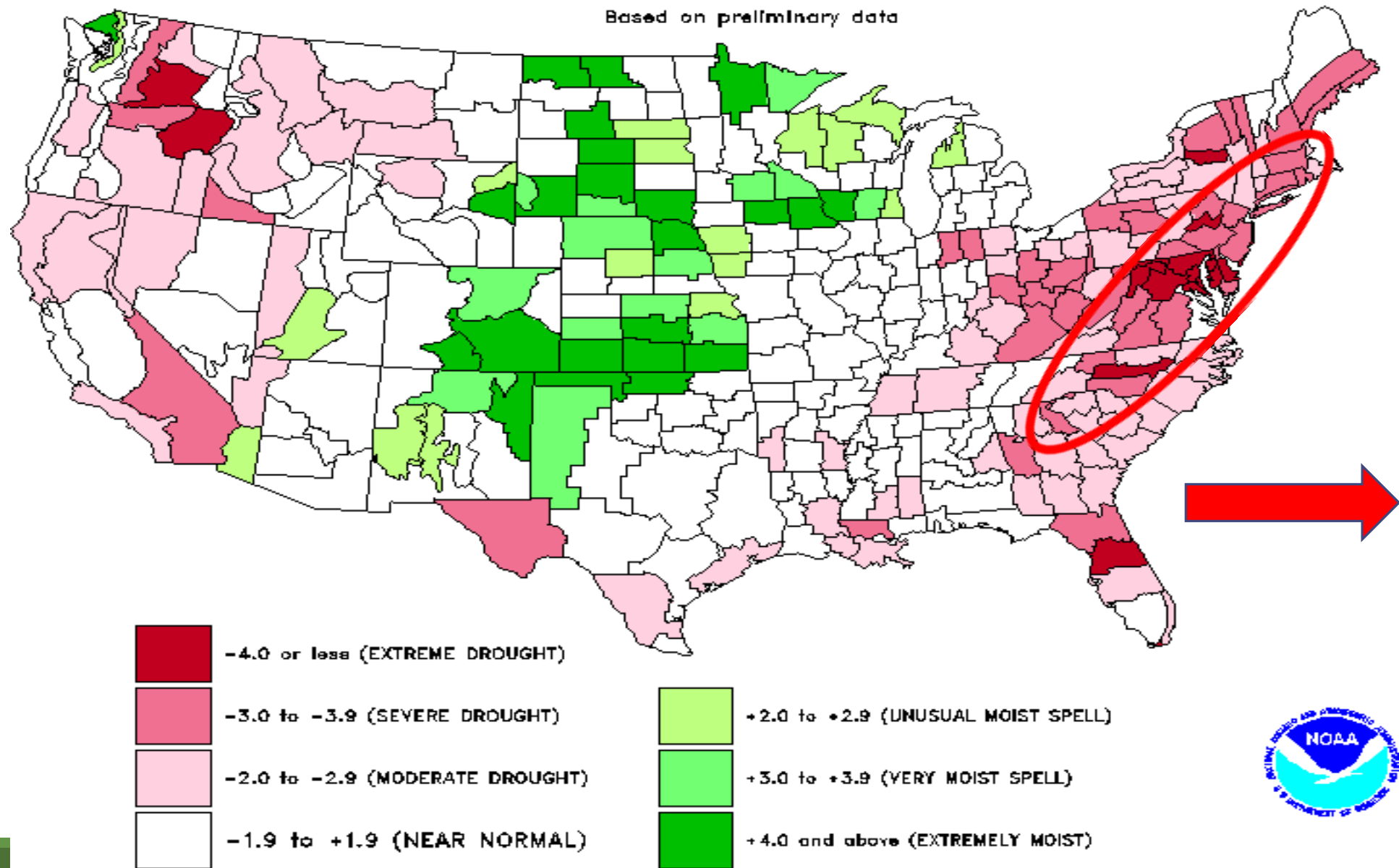


This chart, prepared by the United States Department of Agriculture, shows conditions in the different parts of the United States

DROUGHT SEVERITY INDEX BY DIVISION (LONG TERM PALMER)

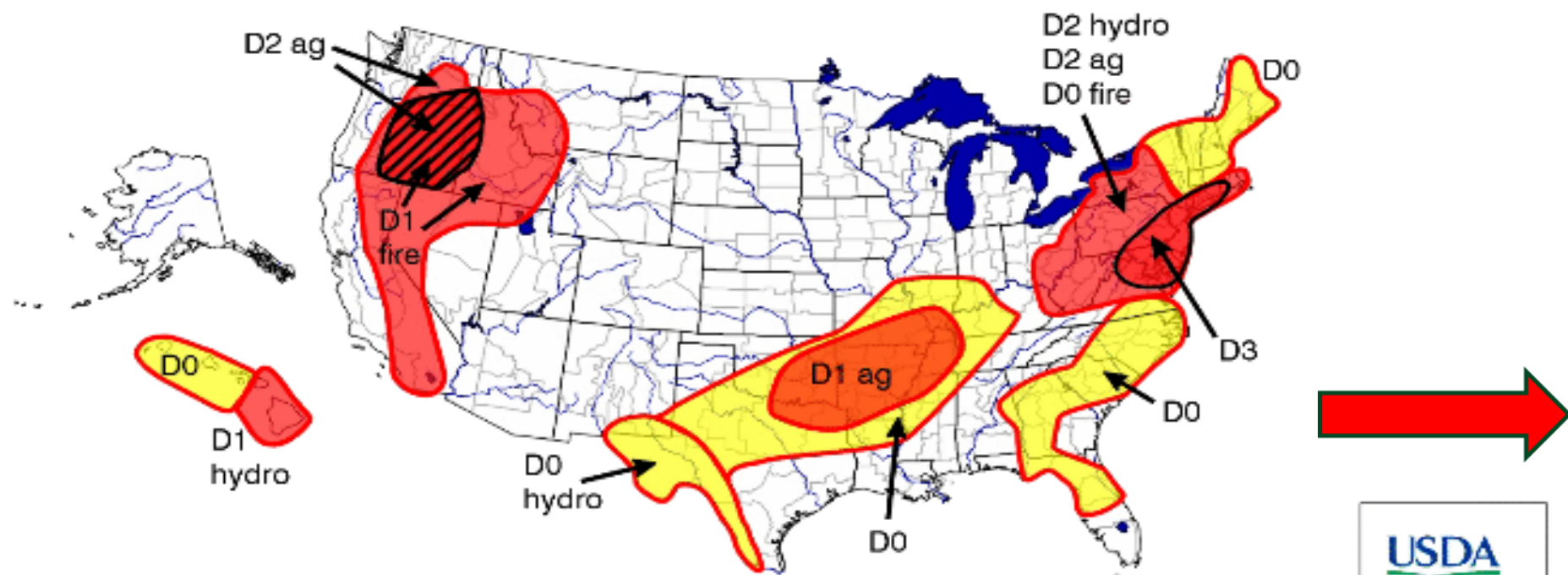
AUG 7, 1999

Based on preliminary data



August 3, 1999

Experimental U.S. Drought Monitor



"Drought" means moisture shortages leading to damaged crops or pastures, high wildfire risk, or water shortages. The map is based on information from many sources, including both satellite and surface data, and it focuses on widespread drought. Local conditions may vary.

Yellow (D0) = Drought Watch Area (abnormally dry but not full drought status)

Red (D1-D4) = Current drought ranging in severity from standard (D1) to severe (D2-D3) to extreme (D4)

Crosshatching (▨) = Overlapping drought type areas

Drought type: Used when impacts differ

Ag = agricultural (crops, grasslands)

Fire = forestry (wildfire potential)

Hydro = hydrological (rivers, wells, reservoirs)

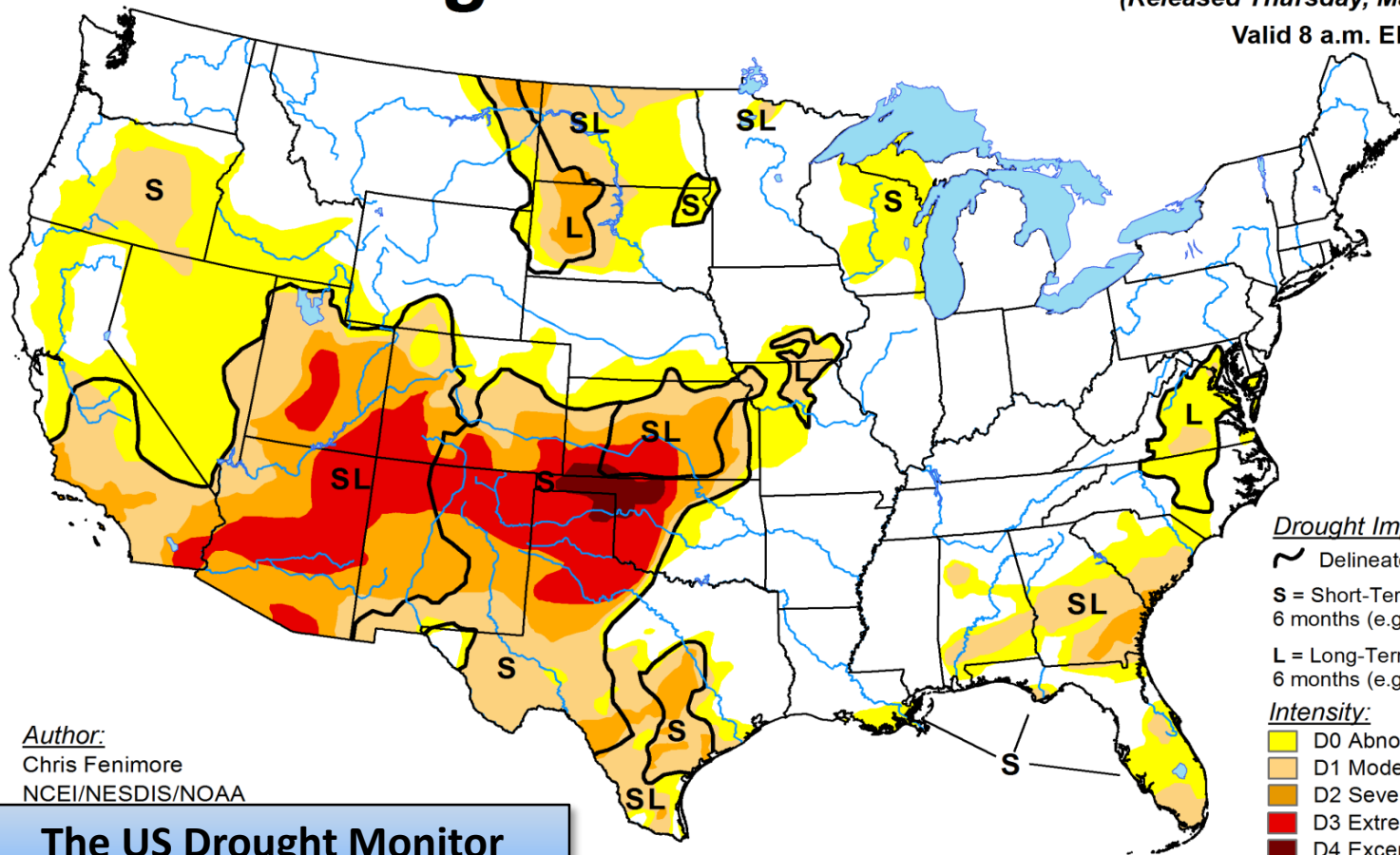
Plus (+) = Forecast to intensify

Minus (-) = Forecast to diminish



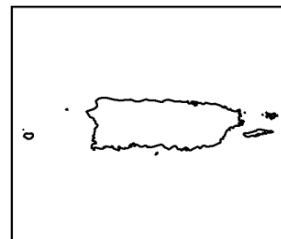
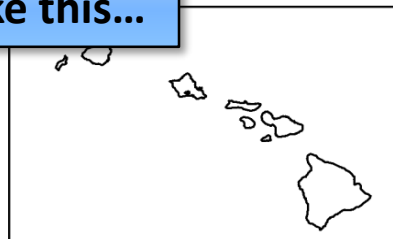
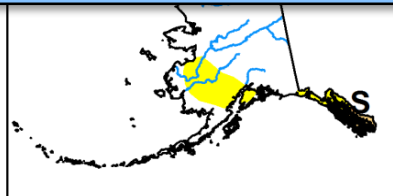
U.S. Drought Monitor

March 27, 2018
(Released Thursday, Mar. 29, 2018)
Valid 8 a.m. EDT



Author:
Chris Fenimore
NCEI/NESDIS/NOAA

**The US Drought Monitor
didn't always look like this...**



Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

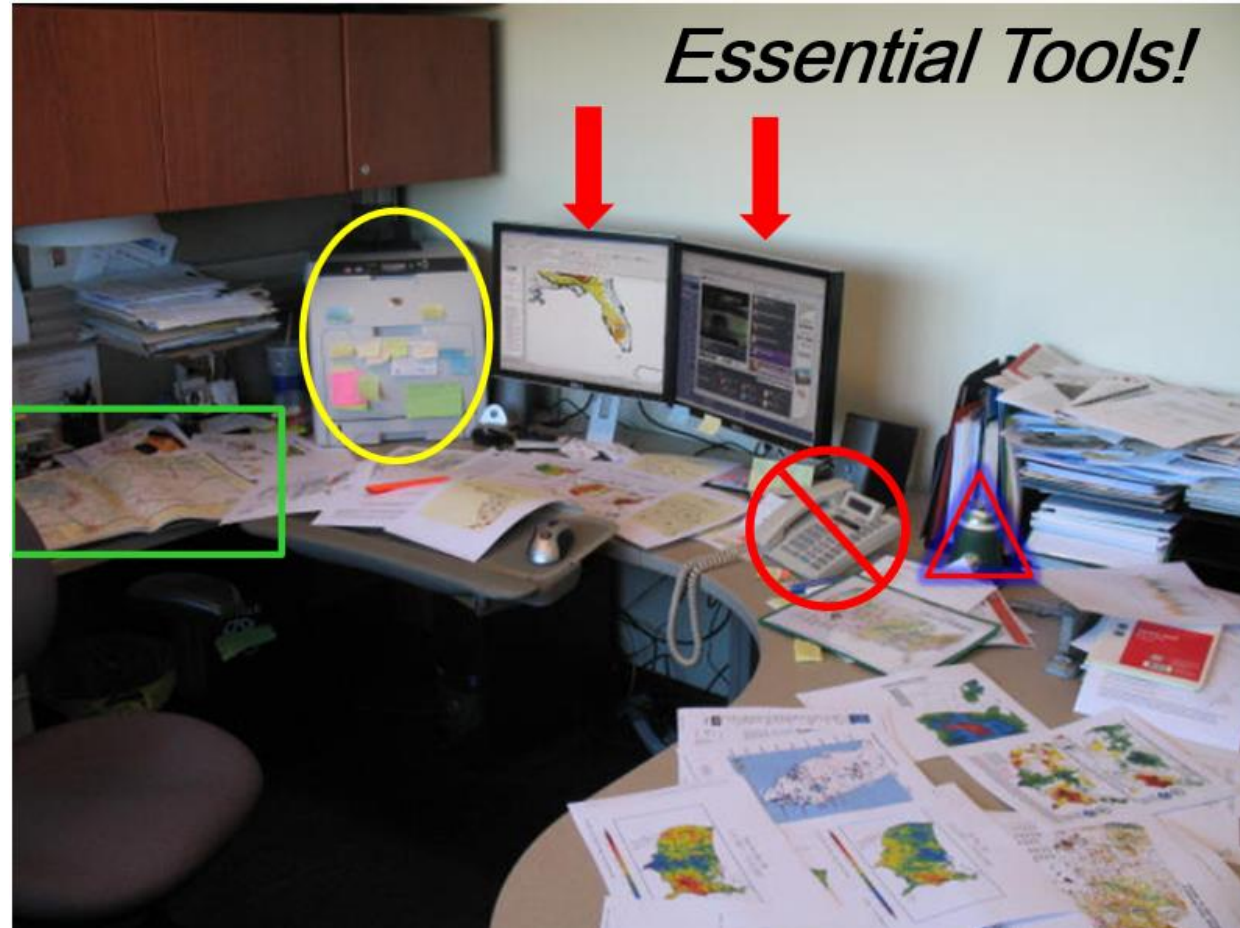
- Yellow D0 Abnormally Dry
- Light Orange D1 Moderate Drought
- Orange D2 Severe Drought
- Red D3 Extreme Drought
- Dark Red D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

The author analyzes and synthesizes all data & local input into one drought map



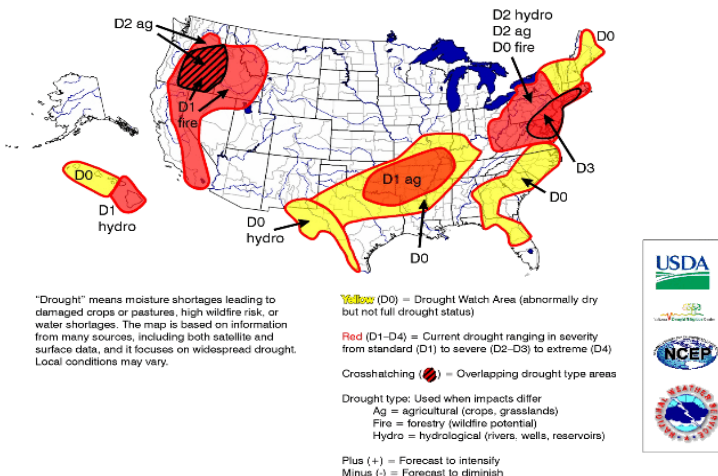
The U.S. Drought Monitor

Since 1999, **NOAA** (CPC, NCEI, WRCC), **USDA**, and the **NDMC** in an **EQUAL Partnership**

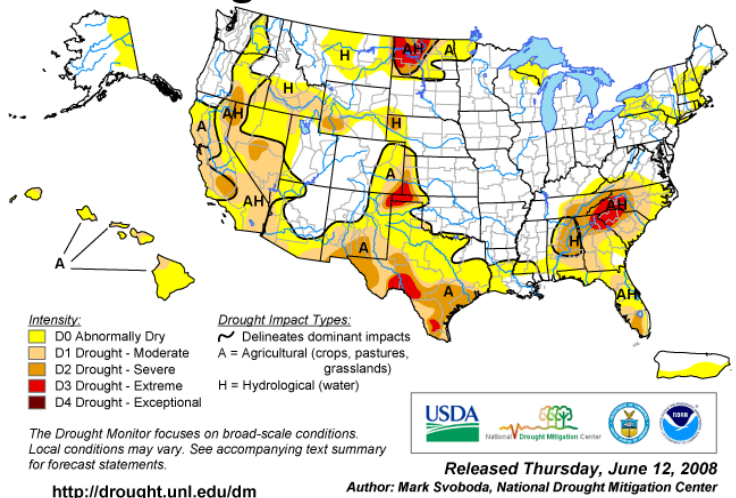
have produced a **weekly** composite drought map -- the U.S. Drought Monitor -- with input from numerous federal and non-federal agencies

- **12** current authors, 2 legacy authors
- **Incorporate** relevant information and products from all entities (and levels of government) dealing with drought (RCC's, SC's, federal/state agencies, etc.) **(450+ experts)**

August 3, 1999
Experimental U.S. Drought Monitor



U.S. Drought Monitor June 10, 2008
Valid 8 a.m. EDT

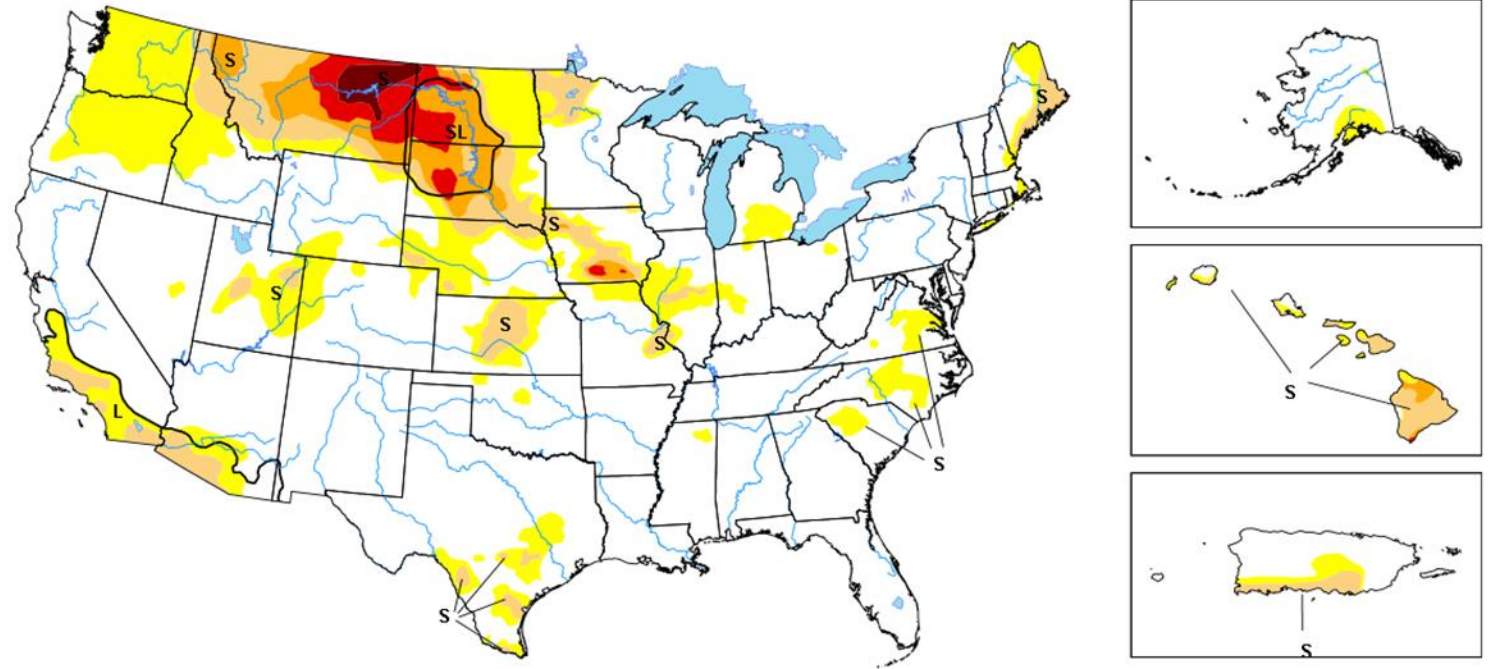


U.S. Drought Monitor (USDM)

- **State-of-the-science** drought assessment in the U.S. since 1999
 - Collaborative effort between NOAA, USDA and NDMC
- **Composite** indicator blends objective indicators and indices with field input from over **~450 experts**
- **Policy implications in** Farm Bill (USDA), IRS, NOAA-NWS and several state drought plans and task forces
- **“Go to source”** for media and the public
 - 12 million page views annually

droughtmonitor.unl.edu

Map for August 24, 2017

 Data valid: August 22, 2017 | Author: [Chris Fenimore](#), NOAA/NESDIS/NCEI


The data cutoff for Drought Monitor maps is each Tuesday at 8 a.m. EDT. The maps, which are based on analysis of the data, are released each Thursday at 8:30 a.m. Eastern Time.

Intensity and Impacts

None
D0 (Abnormally Dry)
D1 (Moderate Drought)

D2 (Severe Drought)
D3 (Extreme Drought)
D4 (Exceptional Drought)

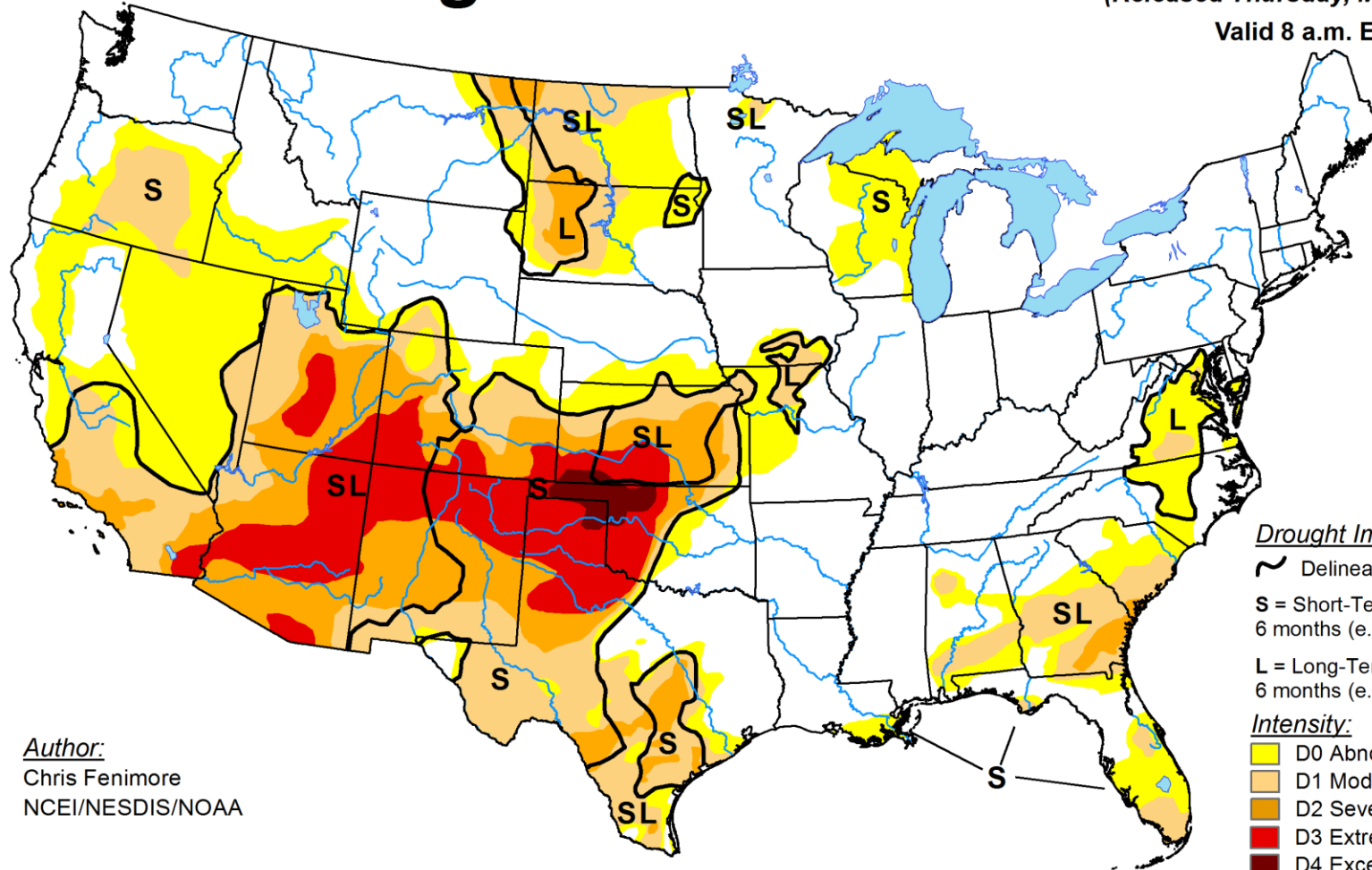
~ Delineates dominant impacts
S - Short-Term impacts, typically less than 6 months (e.g. agriculture, grasslands)
L - Long-Term impacts, typically greater than 6 months (e.g. hydrology, ecology)

U.S. Drought Monitor

March 27, 2018

(Released Thursday, Mar. 29, 2018)

Valid 8 a.m. EDT



Timescales
of potential
impacts
delineated

Drought Impact Types:

~ Delineates dominant impacts

S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

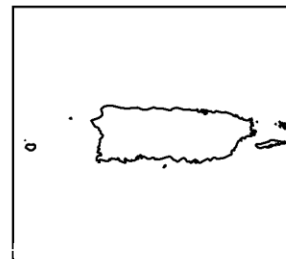
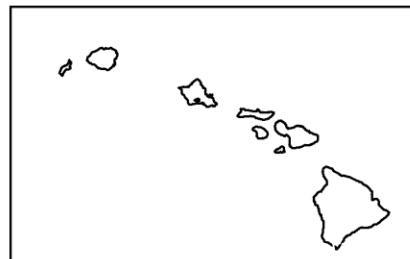
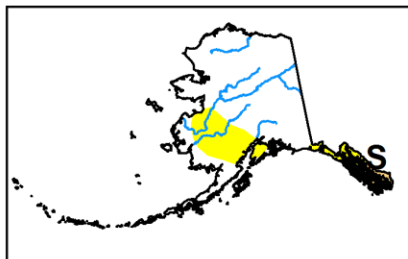
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:

Chris Fenimore
NCEI/NESDIS/NOAA

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

5 levels of intensity
on the map, 4 are
considered drought, 1
is not

Intensity:



D0 Abnormally Dry

} Not Drought



D1 Moderate Drought



D2 Severe Drought



D3 Extreme Drought



D4 Exceptional Drought






} 4 Drought intensities

Percentiles and the U.S. Drought Monitor

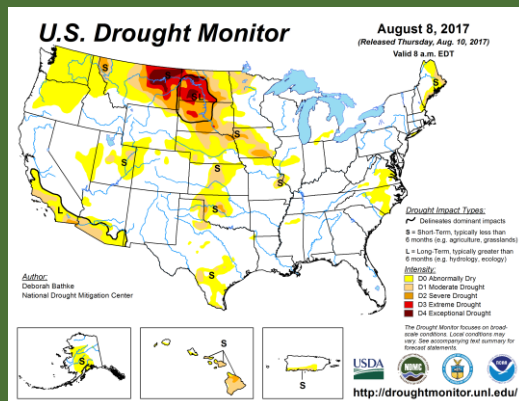
Advantages of percentiles:

- Can be applied to any parameter used in the drought analysis
- Can be used for indicators of any length of data record
- Puts drought in historical perspective:

How many occurrences in a given period of time

D4: Exceptional Drought		(<i>1st-2nd</i> percentile)
D3: Extreme Drought		(<i>3rd-5th</i> percentile)
D2: Severe Drought		(<i>6th-10th</i> percentile)
D1: Moderate Drought		(<i>11th-20th</i> percentile)
D0: Abnormally Dry		(<i>21st-30th</i> percentile)

U.S. Drought Monitor Objectives



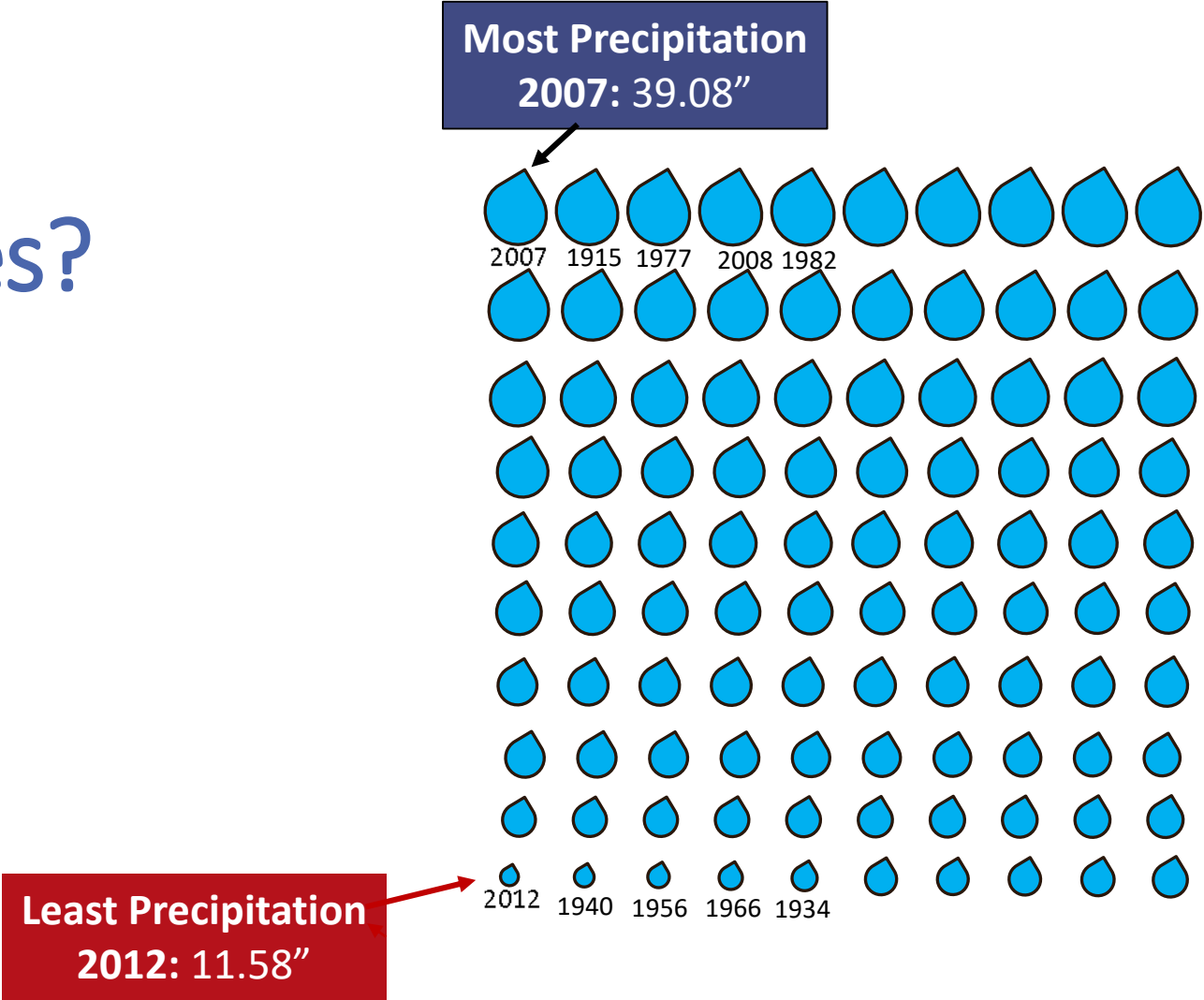
- Assessment of **current** conditions and **current** impacts
- The U.S. Drought Monitor is **NOT** a model
 - The map is made manually each week based off the previous map
- The U.S. Drought Monitor is **NOT** interpreting just precipitation
- The U.S. Drought Monitor is **NOT** a forecast or drought declaration
 - Can be used by decision makers in this way though
- Identifying **impacts**
 - “**S**” short-term impacts, “**L**” long-term impacts or “**SL**” for a combination of both
 - “**S**”- ~6 month time scales or less, “**L**”- greater than ~6 month time scales
- Incorporate **local expert judgement and input**
 - Accomplished via email and impact reports, data, photos...
 - Validation of the map and various inputs/indicators
- Authors try to be as **objective** as possible (using the percentiles methodology) and the **“Convergence of evidence”** approach
 - The physical data and indicators **must** support the depiction on the map
 - Impact data validates physical data

U.S. Drought Monitor Approach

“Convergence of Evidence”

- Many types of drought “information” can be collectively analyzed
 - *Determining if the majority of information is ‘converging’ (telling the same story)* about the accuracy, or inaccuracy, of the drought as depicted by the U.S. Drought Monitor
- Authors need to *look at 100% of the data, BUT don’t believe in any one piece of data input 100%* in making a decision...
- *Multiple indicators and many types of information are part of the analysis*
 - These data will identify different climatic and hydrologic parameters which are needed to understand the complete picture of a drought indicator’s performance and how they interact in each part of the country
- *Impacts are the “ground truth”*, yet aren’t monitored to the extent which other data are....you can’t measure what you don’t monitor!

What are percentiles?

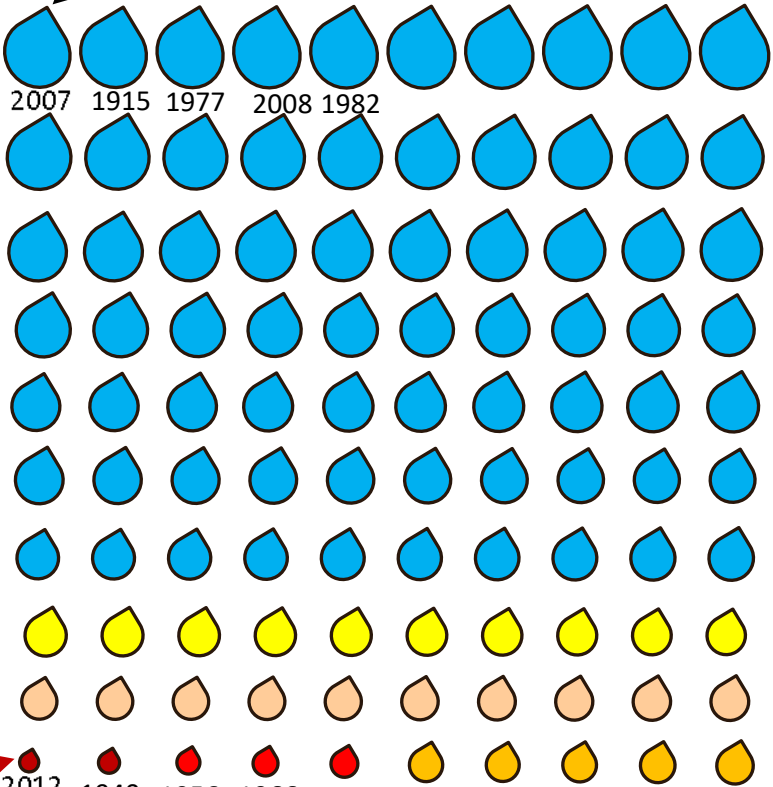


What are percentiles?

Percentile

	D0	Abnormally Dry	21-30
	D1	Moderate Drought	11-20
	D2	Severe Drought	6-10
	D3	Extreme Drought	3 - 5
	D4	Exceptional Drought	1 - 2

Most Precipitation
2007: 39.08"

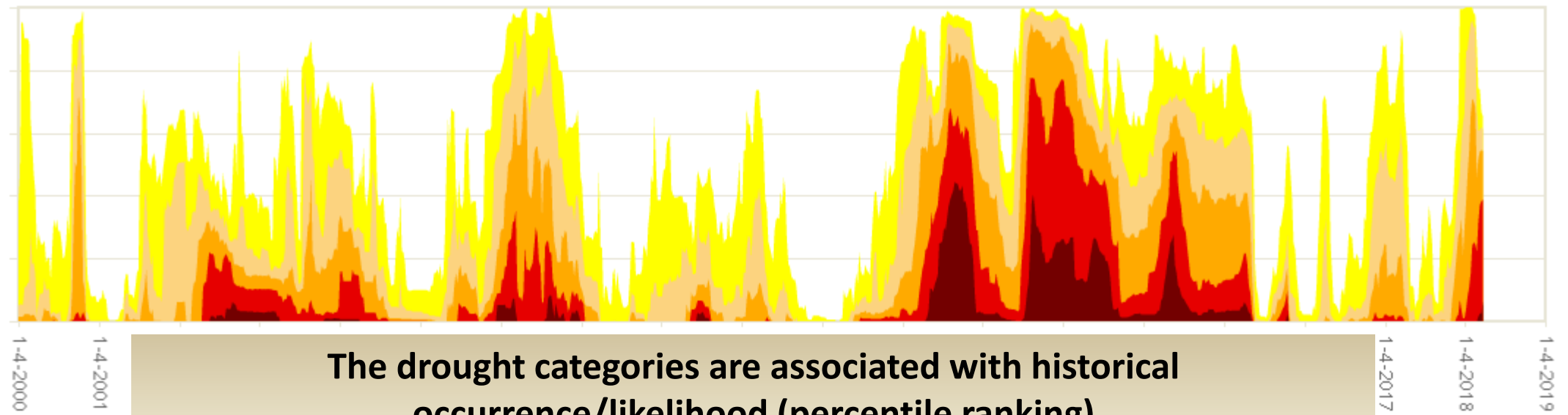


Near
Normal
31-100
Percentile

Least Precipitation
2012: 11.58"

1 – 2 percentile

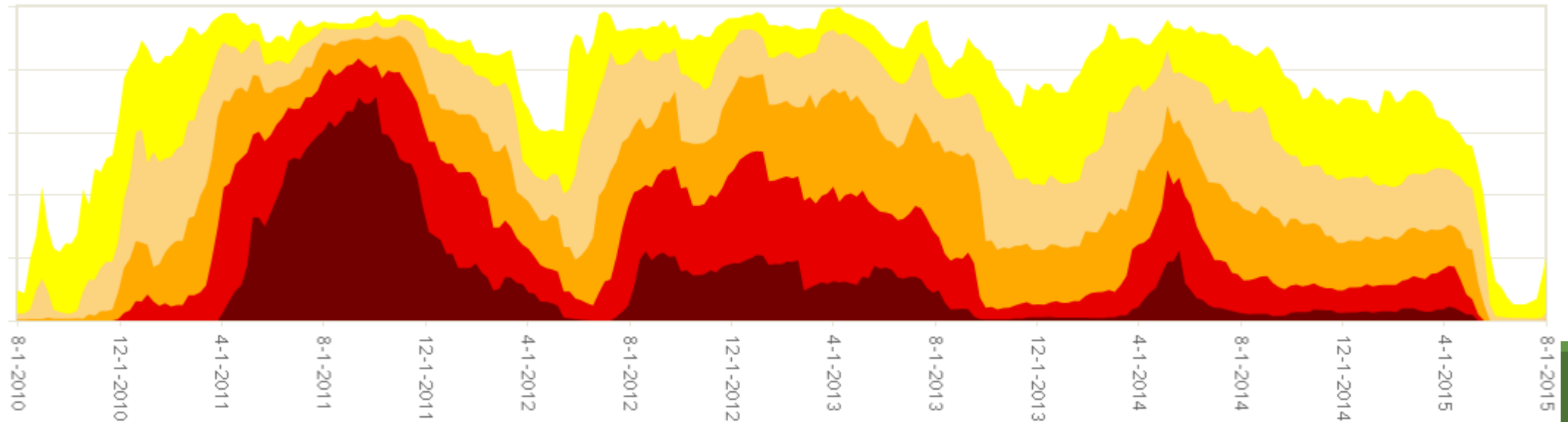
11 (Arkansas-White-Red) Percent Area



The drought categories are associated with historical occurrence/likelihood (percentile ranking)

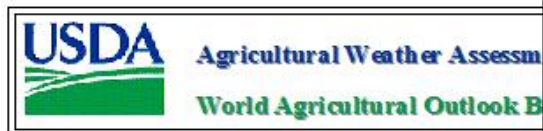
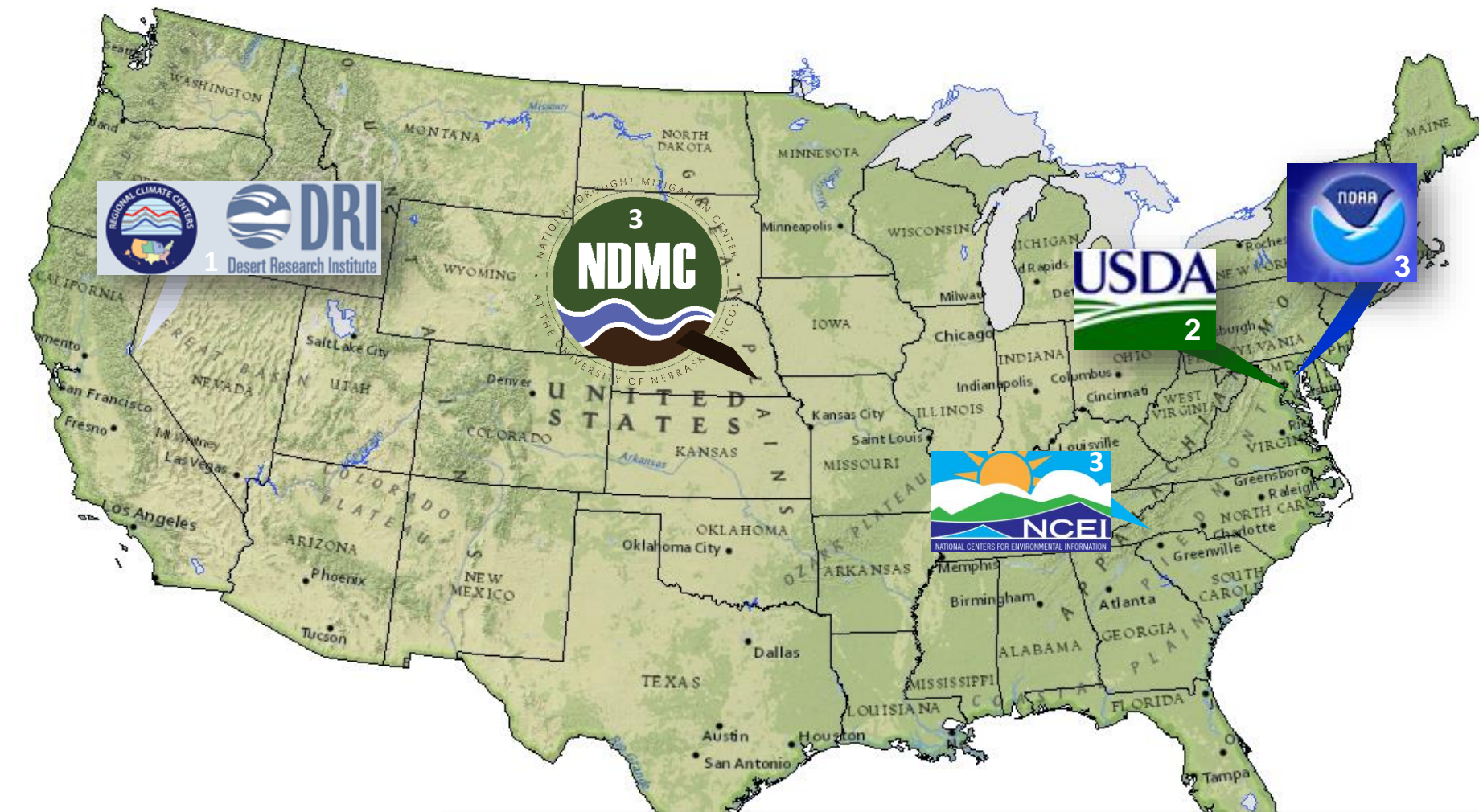
It is not anecdotal or subjective, like “It’s really, really dry!!”or, “I don’t remember it ever being this dry, we have to be D4!!”

Southern Plains Percent Area



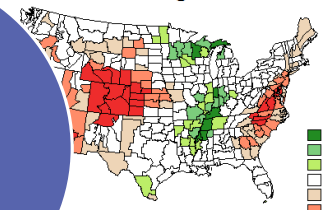
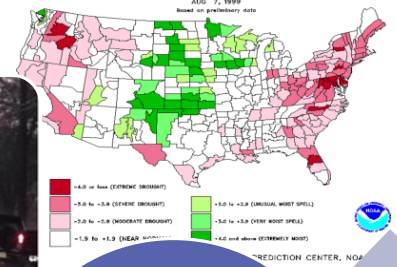
How is all of this really done?





Requirement: Authors must work at a regional or national “center”, government or academia/research
There are currently 12 authors, and all are volunteers

Indices: SPI/PDSI

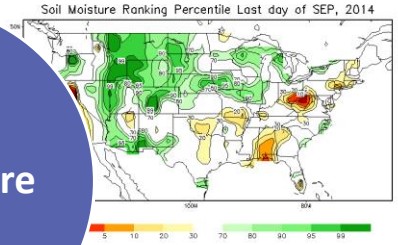
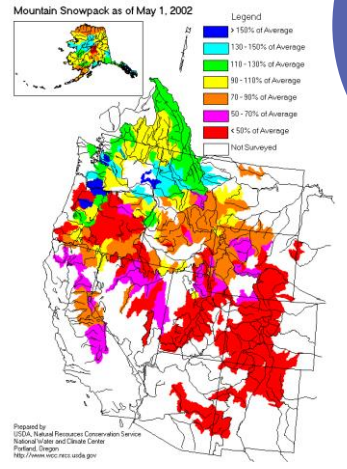


Precipitation and Snow

Soil Moisture

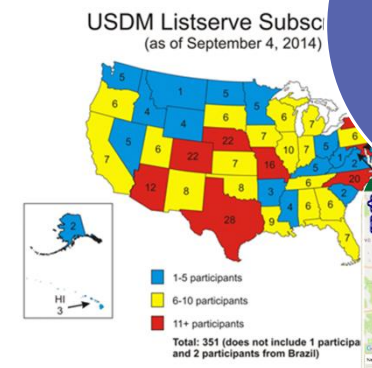
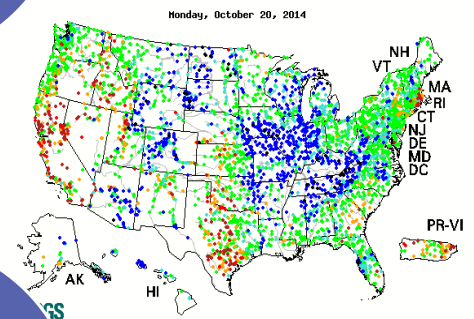
Most of the information analyzed each week falls into one of these categories.

Authors now use roughly **40-50 unique indicators** while creating the U.S. Drought Monitor map, but not all areas are represented equally by all pieces of data.

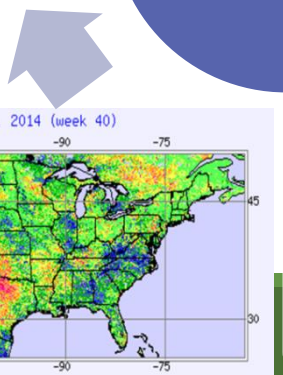
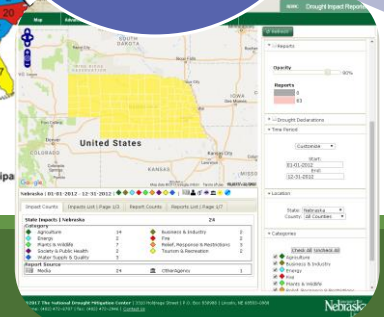


Expert Local Input and Impacts

Streamflow and Reservoirs



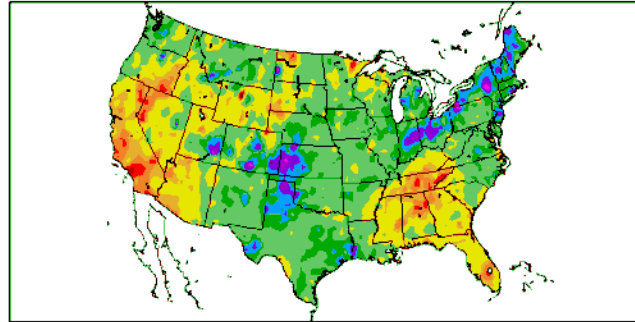
Remote Sensing



Integrates Key Drought Indicators:

- Palmer Drought Index
- SPI
- SPEI
- KBDI
- Modeled Soil Moisture
 - NLDAS
- 7-14 Day Avg. Streamflow
- Precipitation Anomalies
- AHPs Precipitation
- Other data which are available

Water Year SPI
10/1/2006 - 4/19/2007



Generated 4/20/2007 at HPRCC using provisional data.

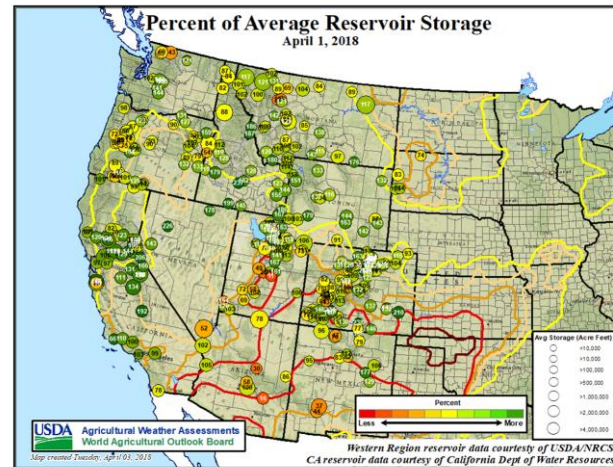
National Drought Mitigation Center

Growing Season:

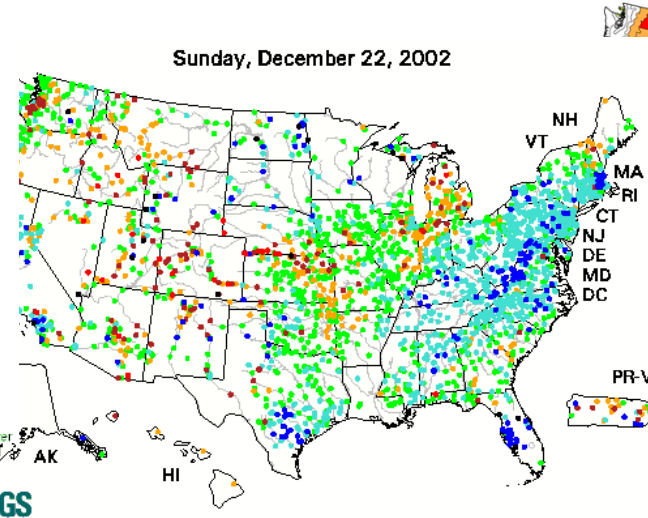
- Crop Moisture Index
- Sat. Veg. Health Index
- VegDRI/ESI/etc.
- Soil Moisture
- Mesonets
- State/Regional data

In The West:

- SWSI
- Reservoir levels
- Snowpack (SNOTEL)
- SWE
- Streamflow

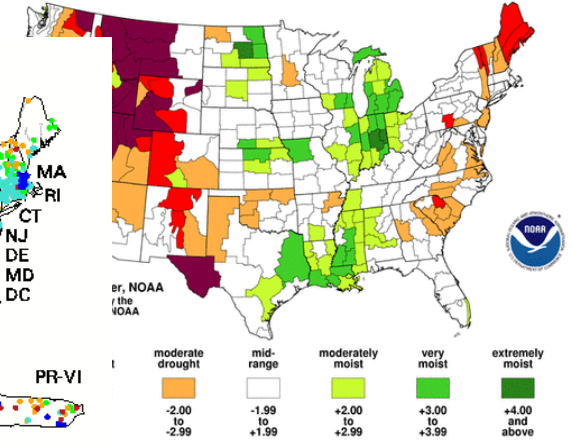


Sunday, December 22, 2002

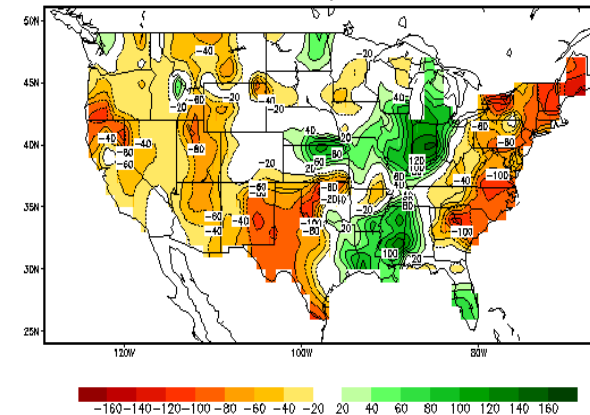


USGS

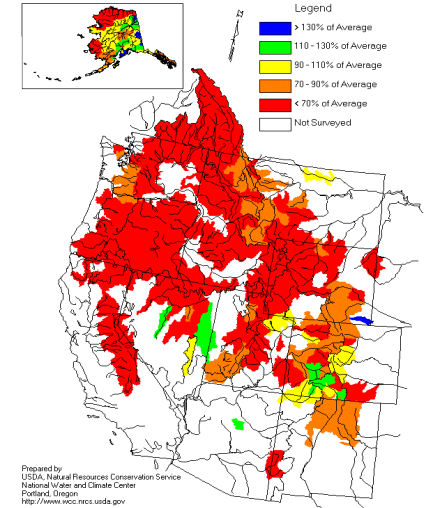
Palmer Drought Index
Long-Term (Meteorological) Conditions
October 21, 2001 - October 27, 2001



Calculated Soil Moisture Anomaly (mm)
OCT 31, 2001

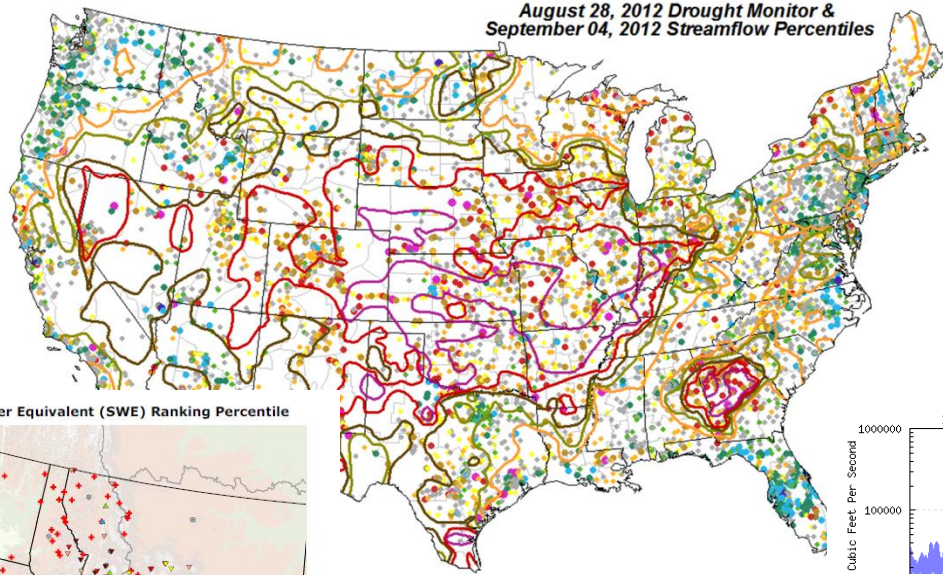


Mountain Snowpack as of May 1, 2001

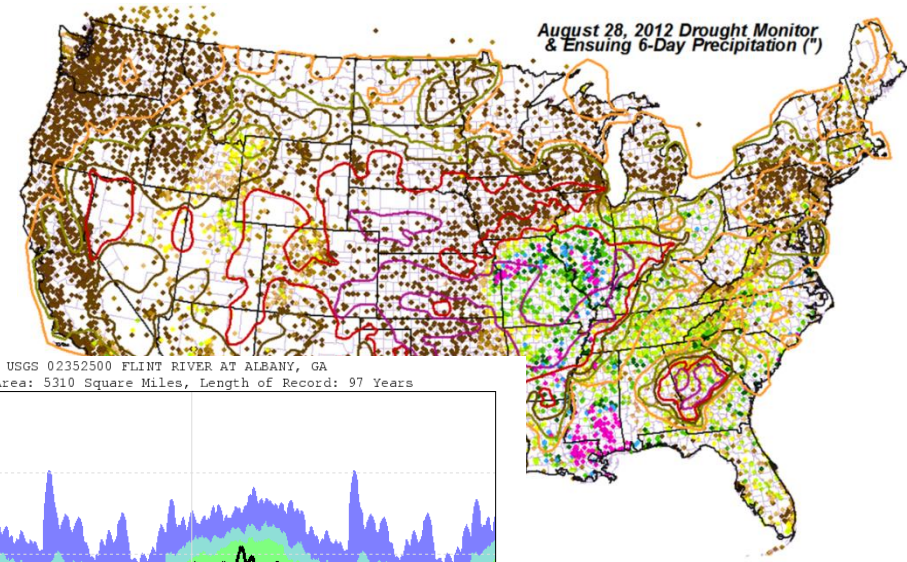


Prepared by
USDA, Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
<http://www.nrcs.usda.gov>

August 28, 2012 Drought Monitor & September 04, 2012 Streamflow Percentiles

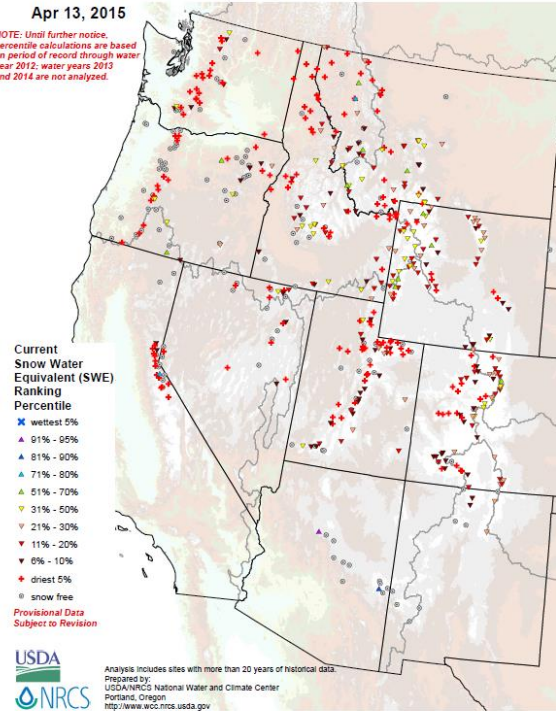


August 28, 2012 Drought Monitor & Ensuing 6-Day Precipitation (*)



SNOTEL Current Snow Water Equivalent (SWE) Ranking Percentile
Apr 13, 2015

NOTE: Until further notice, percentile calculations are based on period of record through water year 2012; water years 2013 and 2014 are not analyzed.



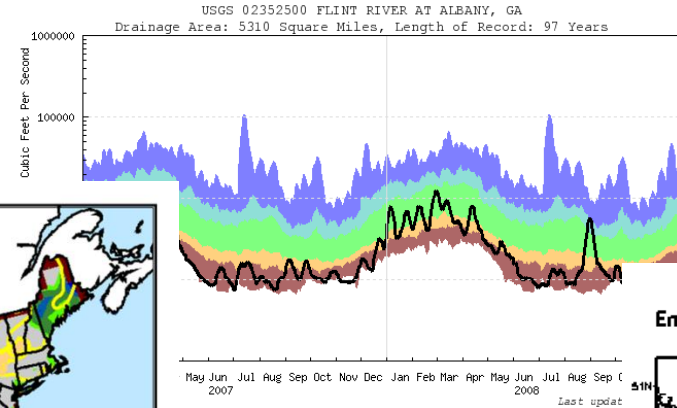
Current Snow Water Equivalent (SWE) Ranking Percentile

- wettest 5%
- ▲ 91% - 95%
- ▲ 81% - 90%
- ▲ 71% - 80%
- ▲ 51% - 70%
- ▼ 31% - 50%
- ▼ 21% - 30%
- ▼ 11% - 20%
- ▼ 6% - 10%
- driest 5%
- snow free

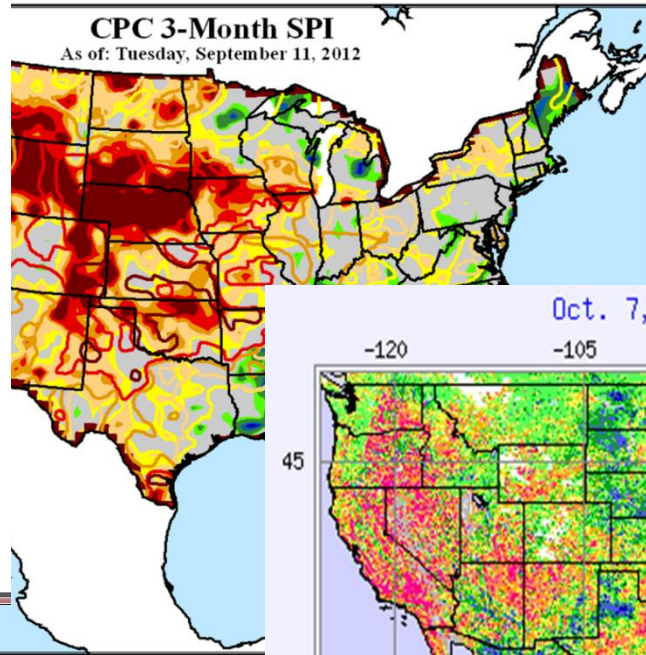
Provisional Data
Subject to Revision



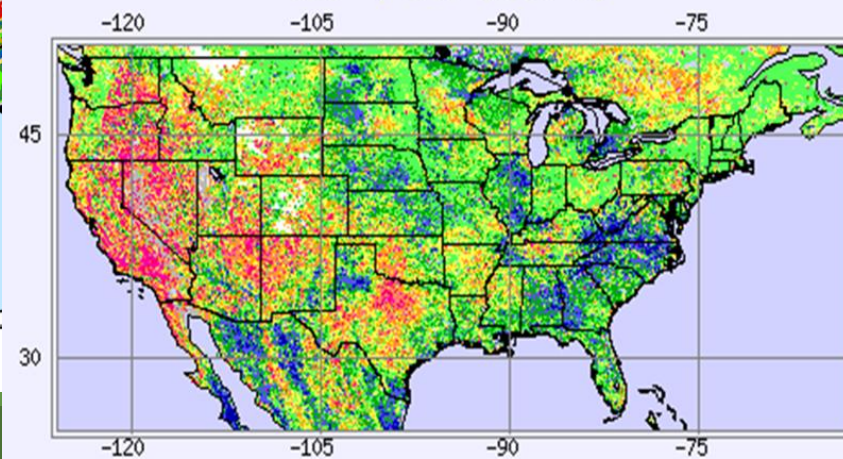
Analysis includes sites with more than 20 years of historical data.
Prepared by:
USDA/NRCS National Water and Climate Center
Portland, Oregon
<http://www.wcc.nrcs.usda.gov>



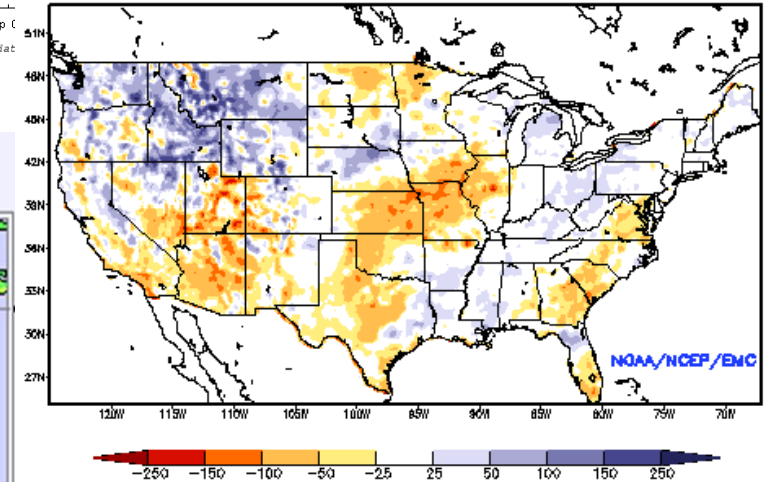
CPC 3-Month SPI
As of: Tuesday, September 11, 2012



Oct. 7, 2014 (week 40)



Ensemble-Mean - Current Total Column Soil Moisture Anomaly (mm)
NCEP NLDAS Products Valid: APR 22, 2018



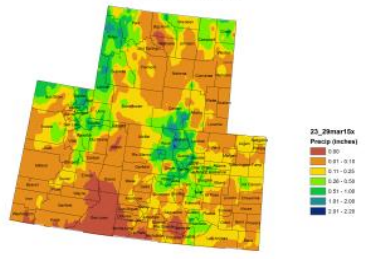
Local Inputs

4/1/2015

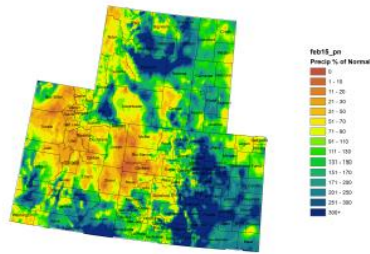
NIDIS Drought and Water Assessment

PRECIPITATION

Colorado, Utah and Wyoming 7 Day Precipitation
23 - 29 March 2015



Colorado, Utah and Wyoming February 2015 Precipitation
as a Percentage of Normal



The images above use daily precipitation statistics from CoAgMet stations. From top to bottom, and left to right: accumulated precipitation in inches; current month-to-inches; last month's precipitation as a percent of average precipitation as a percent of average.

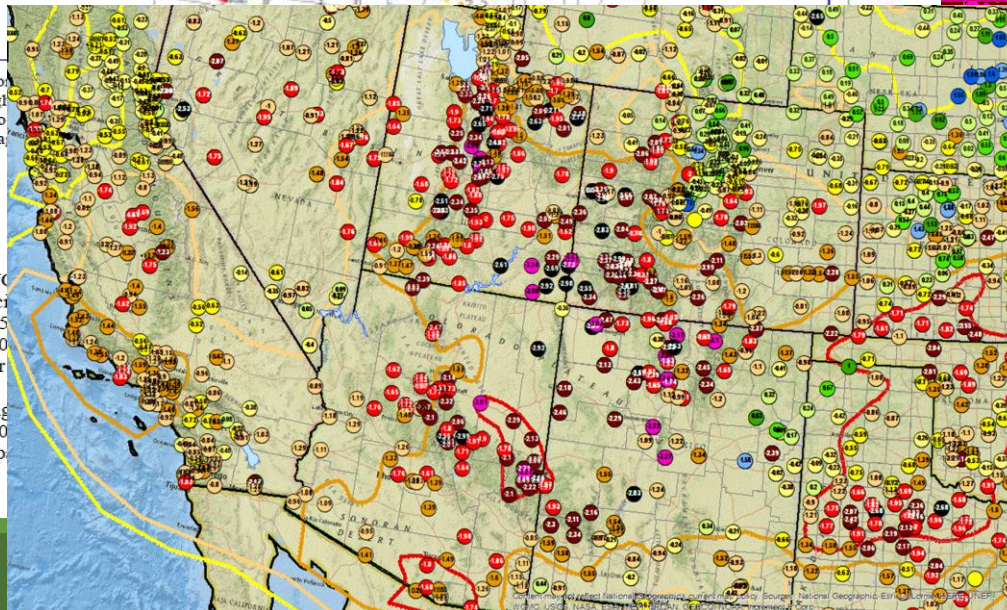
Last Week Precipitation:

- Another fairly quiet week across the UO
- The Upper Green River basin saw prec elevations of Sublette County, up to 0.5 County received between 0.25 and 1.00 Farther downstream in the Green River inches.
- In northeastern Utah, the Wasatch Rang precipitation, with totals of 0.25 to 1.00 range, and some areas in the northern p

http://climate.colostate.edu/~drought/current_assessment.php

SNOTEL AND SNOWPACK

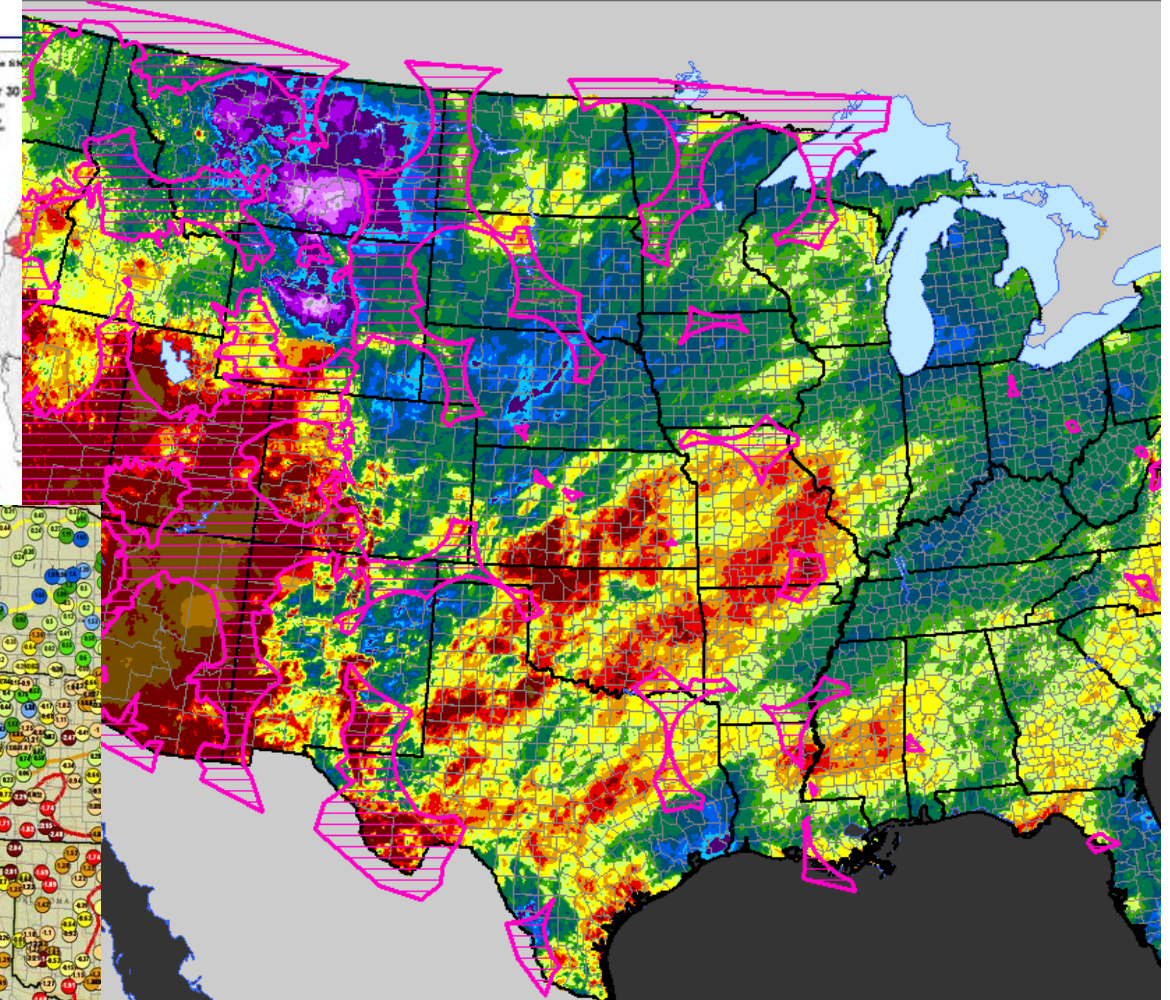
Snotel Water Year 2015 Precipitation Percentile Ranking for
31 March 2015 (Stations with 15+ years of data only)



processing Customize Windows Help

000

Export Map...

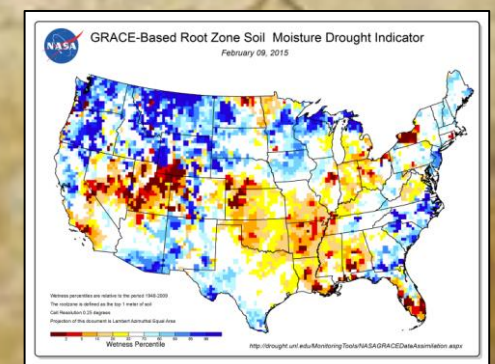
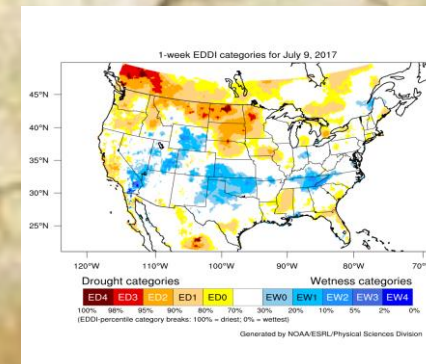
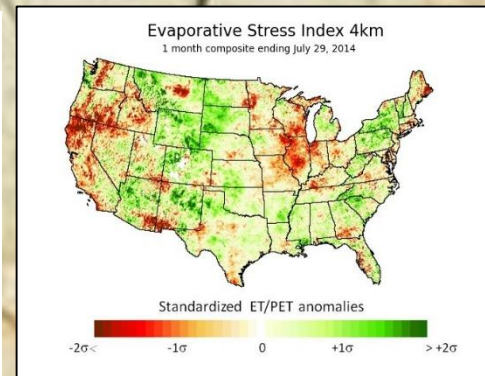
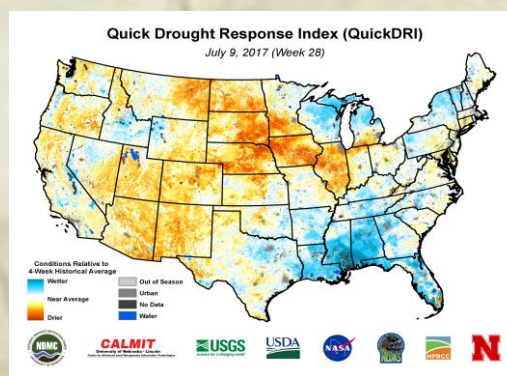
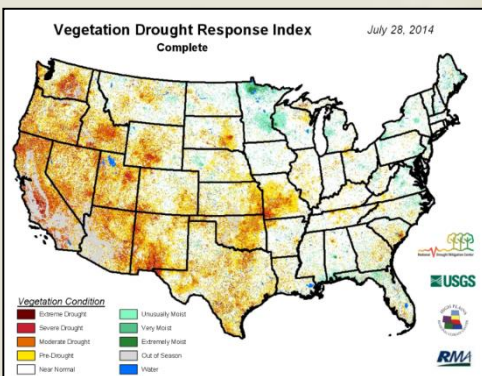
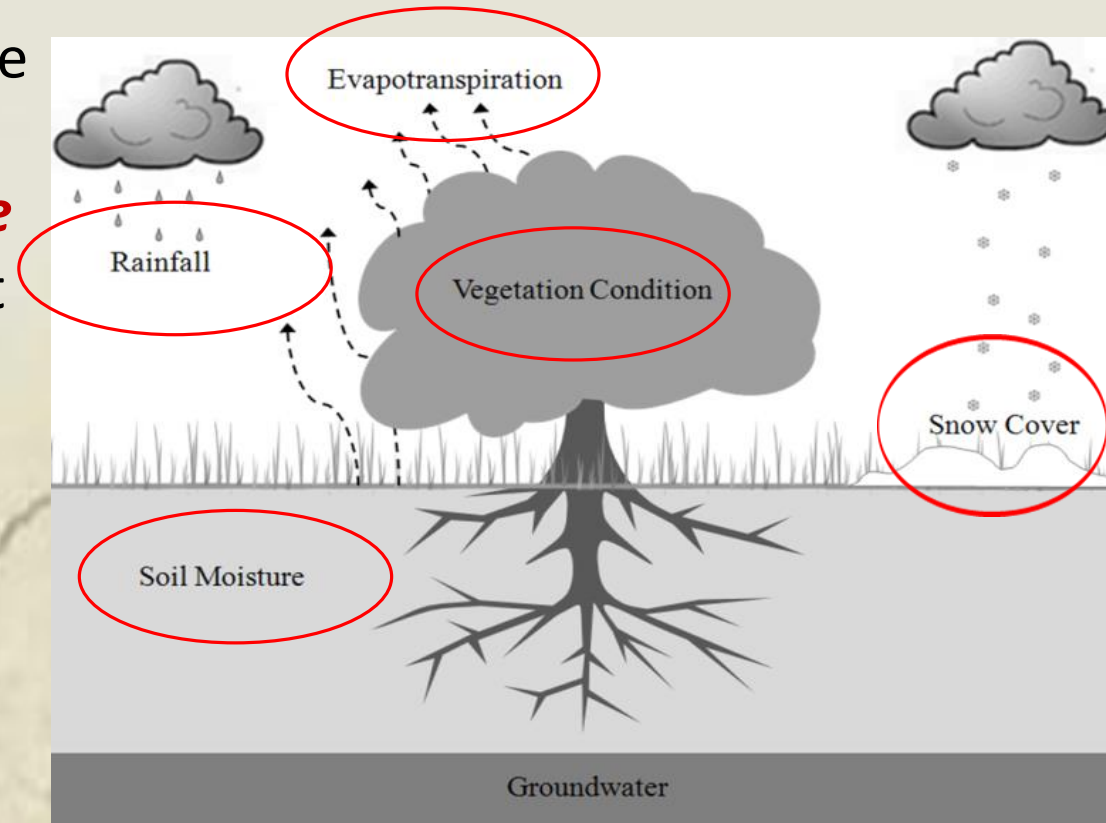


Emerging Satellite-based Observations and Products

Over the past 10+ years, a number of satellite remote sensing-based tools and **products characterizing different parts of the hydrologic cycle that influence drought conditions** allowing new composite drought indicators to be developed.

Examples

- Evaporative Stress Index (ESI)
- Quick Drought Response Index (QuickDRI)
- Evaporative Demand Drought Index (EDDI)
- GRACE soil moisture and groundwater anomalies
- Vegetation Drought Response Index (VegDRI)

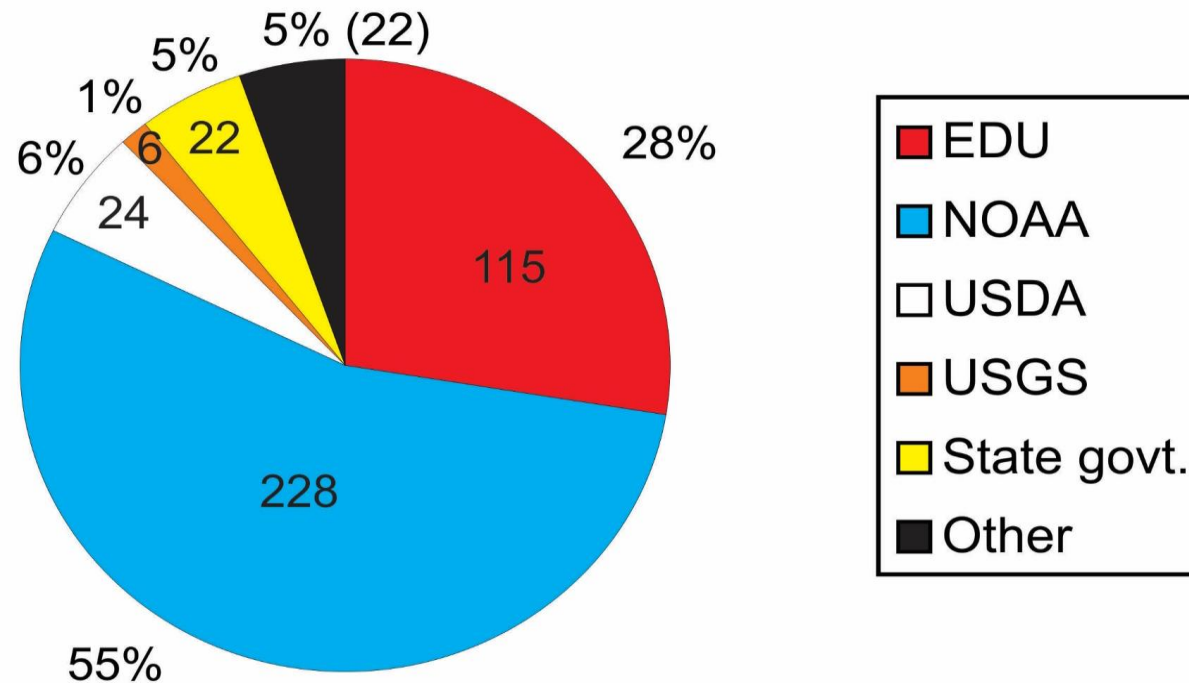


Regional and Local Feedback/Input Process

- Annual User **Feedback Forums** (USDN/NADM) have been held every year since 2000
- Various webinars/telecons/reports/data/products
- **Regional Climate Centers** and NOAA **Regional Climate Service Directors and Coordinators along w/ Weather Forecast Offices (WFOs)**
- **State Climatologists**
- **USDA FSA/NRCS**
- **Native American Tribal input**
- **CoCoRaHS (impacts)**
- National Integrated Drought Information System **(NIDIS) Pilot RDEWS** basin webinars:
 - UCRB (Upper Colorado River Basin)
 - ACF (Apalachicola-Chattahoochee-Flint)/ Carolinas/Southern Plains/MORB (Missouri River Basin)/California/Nevada/Pacific Northwest/Midwest
- **Drought Task Forces**: North Carolina, Hawaii, Oklahoma, Texas, New Mexico, Alabama, Florida, South Dakota, Kentucky, Arizona, Montana, and California
- **And MANY OTHERS !**

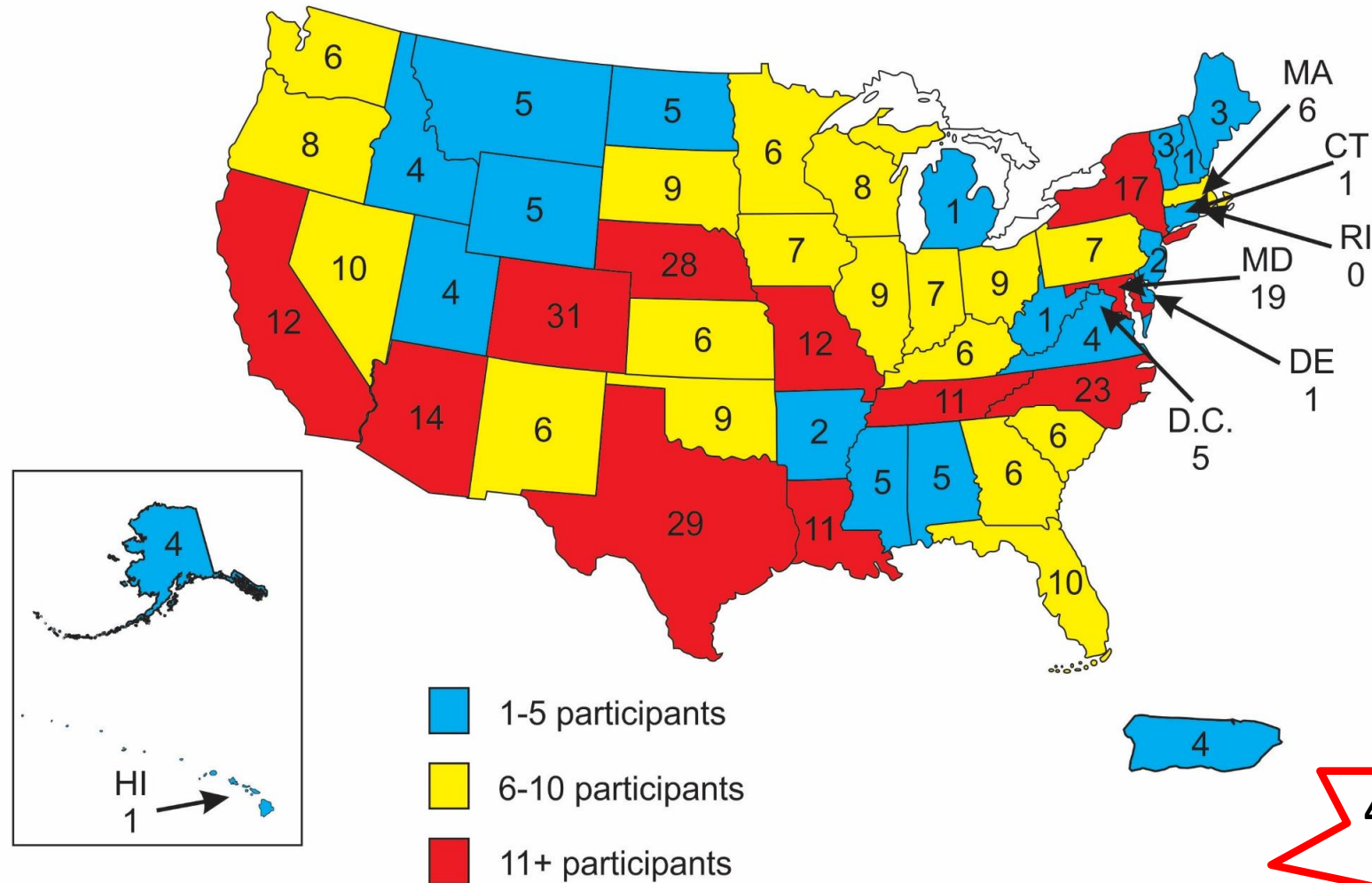
Who participates in the USDM Process?

USDM Listserve Subscribers
(as of August 30, 2017)



USDM Listserve Subscribers

(as of August 30, 2017)



**442 Registered as
of March 2018!**

Some Examples of Decision Making and Policy Using the USDM

(Science before Policy)

Policy:

- 2008/2014 Farm Bill
 - USDA Farm Service Agency, Natural Resources Conservation Service, Risk Management Agency
- Internal Revenue Service
 - Livestock tax deferral program
- U.S. Department of Agriculture
 - Secretarial ***“Fast Track”*** Drought Designations
- NOAA National Weather Service
 - Drought Information Statements
- Environmental Protection Agency
 - Water quality monitoring
- Centers for Disease Control and Prevention
 - Public health
- Bureau of Land Management
- Several States use in their monitoring/plans
- Many others

The United States Drought Monitor

Much more behind the map!

A summary narrative of changes made each week, by region, can be found in the

"Drought Summary"

United States Drought Monitor

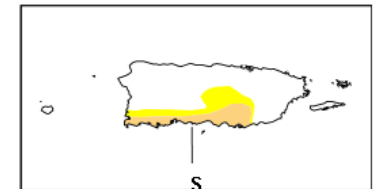
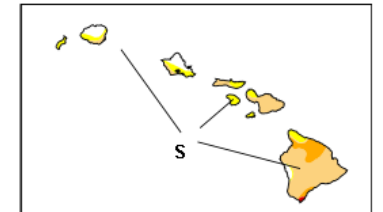
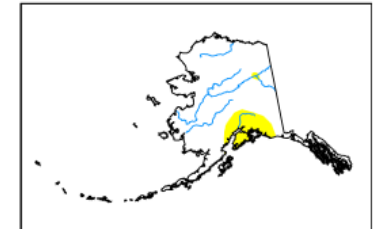
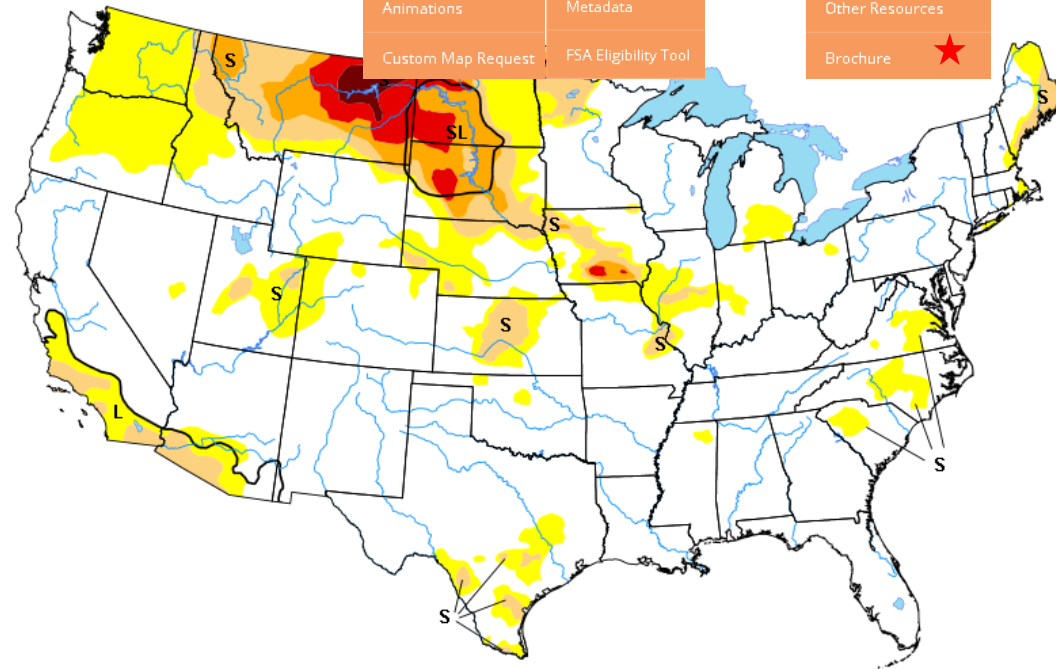
Login

Current Map	Maps	Data	Drought Summary	About USDM	Current Conditions and Outlooks
-------------	------	------	-----------------	------------	---------------------------------

Map for August 24, 2017

Data valid: August 22, 2017 | Author

★ Compare Two Weeks	Time Series ★	Background
Comparison Slider	Data Tables	Contact Us
★ Map Archive	Data Download ★	Drought Classification
★ Change Maps	GIS Data ★	FAQ
Animations	Metadata	Other Resources
Custom Map Request	FSA Eligibility Tool	Brochure ★



The data cutoff for Drought Monitor maps is each Tuesday at 8 a.m. EDT. The maps, which are based on analysis of the data, are released each Thursday at 8:30 a.m. Eastern Time.

Intensity and Impacts

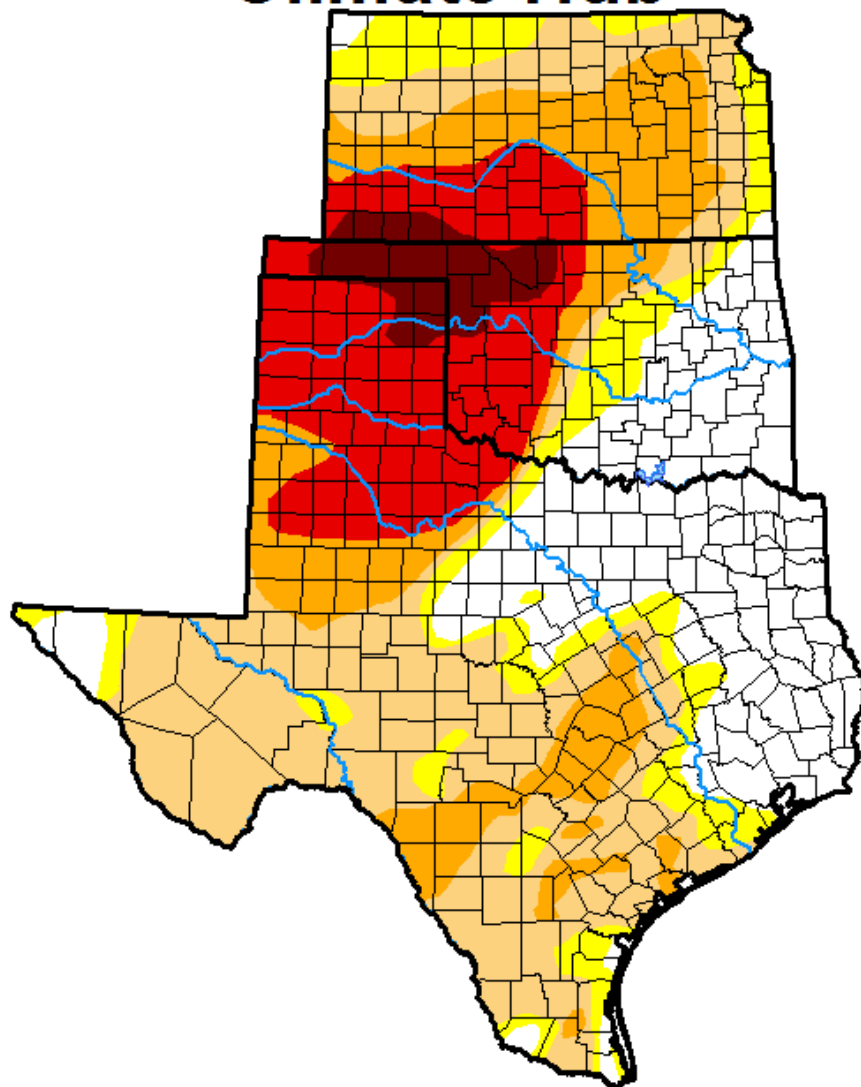
None	D2 (Severe Drought)
D0 (Abnormally Dry)	D3 (Extreme Drought)
D1 (Moderate Drought)	D4 (Exceptional Drought)

~ Delineates dominant impacts

S - Short-Term impacts, typically less than 6 months (e.g. agriculture, grasslands)

L - Long-Term impacts, typically greater than 6 months (e.g. hydrology, ecology)

U.S. Drought Monitor USDA Southern Plains Climate Hub



March 27, 2018

(Released Thursday, Mar. 29, 2018)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	23.81	76.19	64.84	36.14	19.55	3.98
Last Week <i>03-20-2018</i>	22.83	77.17	63.09	34.60	19.24	1.43
3 Months Ago <i>12-26-2017</i>	23.61	76.39	40.10	8.27	0.07	0.00
Start of Calendar Year <i>01-02-2018</i>	21.20	78.80	40.69	11.99	0.07	0.00
Start of Water Year <i>09-26-2017</i>	67.42	32.58	4.77	0.29	0.00	0.00
One Year Ago <i>03-28-2017</i>	38.09	61.91	26.98	8.07	0.61	0.00

Intensity:

D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought
D2 Severe Drought	

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Chris Fenimore
NCEI/NESDIS/NOAA



<http://droughtmonitor.unl.edu/>

U.S. Drought Monitor Change Maps

At various time-scales of:

1 week

4 weeks

8 weeks

12 weeks

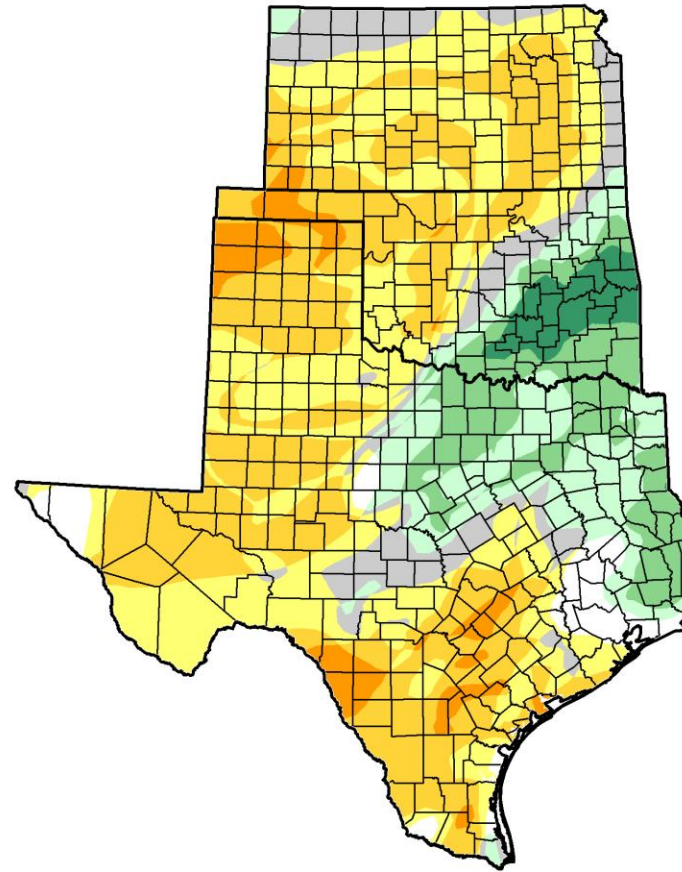
24 weeks

1 year

Calendar year

Water year

U.S. Drought Monitor Class Change - USDA Southern Plains Climate Hub 3 Months



March 27, 2018
compared to
January 2, 2018

<http://droughtmonitor.unl.edu>



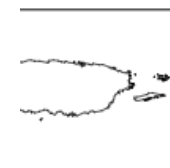
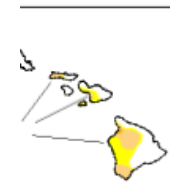
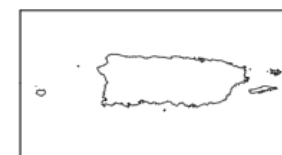
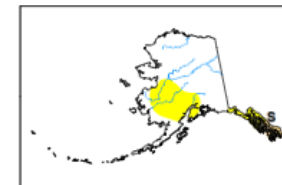
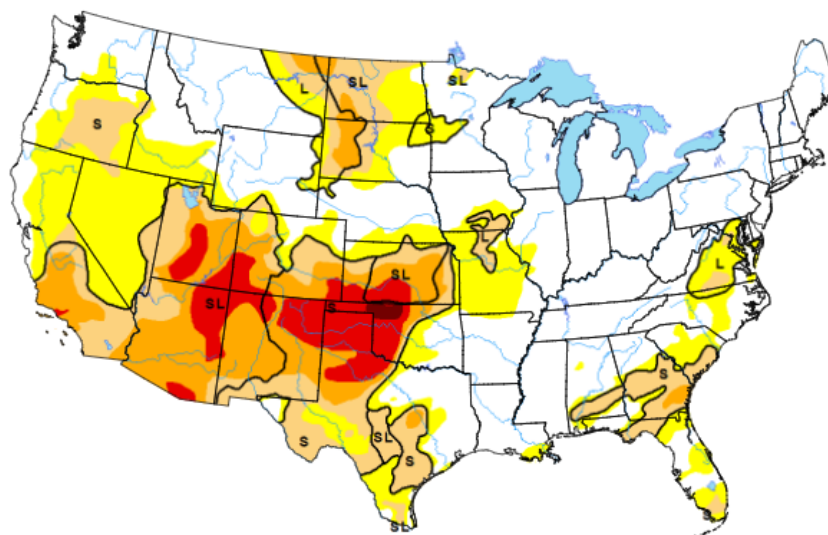
New USDM maps in Spanish

Monitor de Sequía de los Estados Unidos

[Login](#)[Login](#)[Mapa Actual](#)[Los Mapas](#)[Los Datos](#)[Acerca del Monitor de Sequía](#)[Condiciones Actuales y Perspectivas](#)[En Español](#)

Mapa para marzo 15, 2018

Datos válidos: marzo 13, 2018 | Autor: [Richard Tinker](#), NOAA/NWS/NCEP/CPC



El límite de datos para los mapas de Monitor de Sequía es cada martes a las 8 a.m. EDT. Los mapas, que se basan en el análisis de los datos, se publican cada jueves a las 8:30 am Hora del Este.

Intensidad e impactos

Ninguna

D0 {Anormalmente Seco}

D1 {Sequía moderada}

D2 {Sequía severa}

D3 {Sequía extrema}

D4 {Sequía excepcional}

- Delimita impactos dominantes

S - Período corto, típicamente menos de 6 meses {ej. agricultura, pastizales}

L - Período largo, típicamente más de 6 meses {e.g. hidrología, ecología}

Descargar mapa

Mapa corriente: [PNG](#) [PDF](#) [GPG](#)

Mapa anterior: [PNG](#) [PDF](#) [GPG](#)

Para obtener detalles e impactos locales, comuníquese con su [climatólogo](#) o con el [Centro Regional de Clima](#).

Obtener mapas y estadísticas:

[Total EE.UU.](#)[Continental EE.UU.](#)

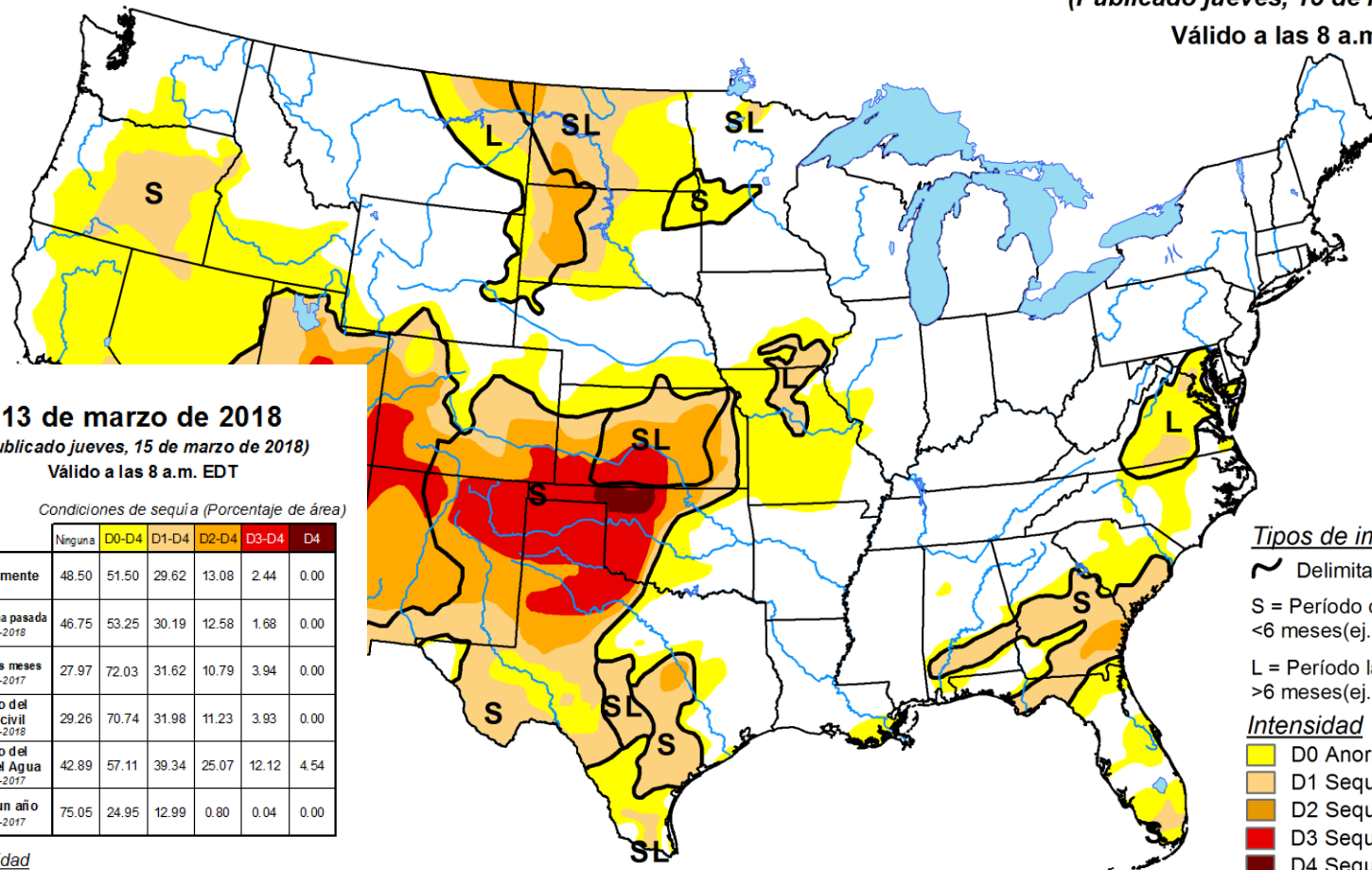
rsday at 8:30 a.m.

culture, grasslands}

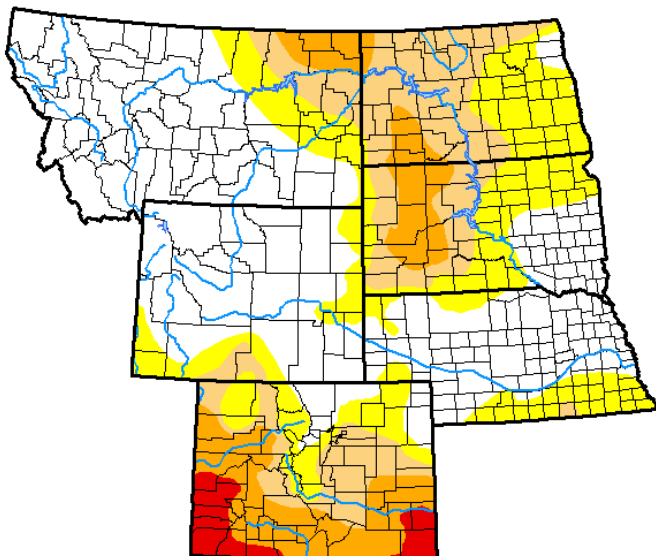
ydrology, ecology}

New USDM maps in Spanish

Monitor de Sequía de los Estados Unidos marzo 13, 2018 (Publicado jueves, 15 de marzo de 2018) Válido a las 8 a.m. EDT



Monitor de Sequía de los Estados Unidos Centro Climático de las Llanuras del Norte del USDA



13 de marzo de 2018
(Publicado jueves, 15 de marzo de 2018)
Válido a las 8 a.m. EDT

Condiciones de sequía (Porcentaje de área)

	Ninguna	D0-D4	D1-D4	D2-D4	D3-D4	D4
Actualmente	48.50	51.50	29.62	13.08	2.44	0.00
La semana pasada 03-06-2018	46.75	53.25	30.19	12.58	1.68	0.00
Hace tres meses 12-12-2017	27.97	72.03	31.62	10.79	3.94	0.00
Inicio del año civil 01-02-2018	29.26	70.74	31.98	11.23	3.93	0.00
Inicio del Año del Agua 09-26-2017	42.89	57.11	39.34	25.07	12.12	4.54
Hace un año 03-14-2017	75.05	24.95	12.99	0.80	0.04	0.00

Intensidad

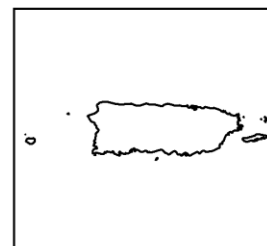
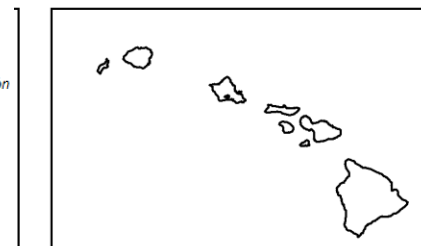
■ D0 Anormalmente seco ■ D3 Sequía extrema
■ D1 Sequía moderada ■ D4 Sequía excepcional
■ D2 Sequía severa

El Monitor de Sequía analiza condiciones a gran escala, por lo que las condiciones locales pueden variar. Para una mejor interpretación se recomienda ver el texto anexo.

Autor
Richard Tinker
CPC/NOAA/NWS/NCEP



<http://droughtmonitor.unl.edu/>



HT MITIGATION CENTER

Tipos de impacto de la Sequía

~ Delimita impactos dominantes
 S = Período corto, típicamente <6 meses (ej. agricultura, pastizales)
 L = Período largo, típicamente >6 meses (ej. hidrología, ecología)

Intensidad

■ D0 Anormalmente Seco
■ D1 Sequía moderada
■ D2 Sequía severa
■ D3 Sequía extrema
■ D4 Sequía excepcional

El Monitor de Sequía analiza condiciones a gran escala, por lo que las condiciones locales pueden variar. Para una mejor interpretación se recomienda ver el texto anexo.



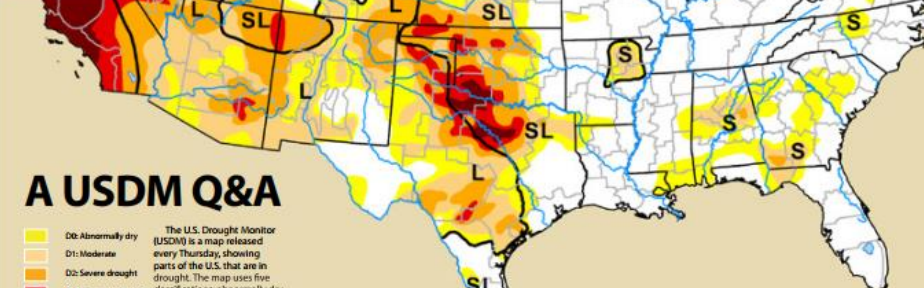
<http://droughtmonitor.unl.edu/>

US Drought Monitor Brochure

<http://droughtmonitor.unl.edu/data/docs/USDMbrochure.pdf>

Also available in Spanish

A USDM Q&A



Get involved!
Want to contribute your observations to the USDM process? Here are some ways:
1) Talk to your state climatologist. You can find his or her name at the American Association of State Climatologists (www.stateclimate.org).
2) Email droughtmonitor@unl.edu.
3) Use the contact form on [drought.gov](http://drought.gov/drought/contact) (<http://drought.gov/drought/contact>).
4) Become a CoCoRaHS observer (www.cocorahs.org) and submit drought reports along with daily precipitation observations.
5) Submit reports, rain or shine, to the Drought Impact Reporter (DIR) at <http://droughtreporter.unl.edu/> at regular intervals – annually, seasonally, or monthly, as feasible. Reports submitted directly to the DIR can include photos, and we recommend a systematic technique such as using photo points to document range condition. For how-to information, please see [Tracking Drought Impacts on Rangeland](http://drought.unl.edu/ranchplan/Overview/TrackingDroughtImpacts.asp) (<http://drought.unl.edu/ranchplan/Overview/TrackingDroughtImpacts.asp>) or information on submitting condition reports, found on the DIR site.

What agencies or organizations are responsible for the USDM?
The Drought Monitor has been a team effort since its implementation in 1999, produced jointly by the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of Agriculture (USDA). The NDMC hosts the web home of the USDM and the associated data, and provides the map and data to NOAA, USDA and other agencies. It is freely available to the public, media and anyone else, via the web at <http://droughtmonitor.unl.edu/>.

Who uses it, and what do they do with it?
The USDA uses the USDM to trigger disaster declarations and eligibility for low-interest loans. The Farm Service Agency uses it to help determine eligibility for their Livestock Forage Program (LFP), and the Internal Revenue Service uses it for tax deferral on forced livestock sales due to drought. State, local, tribal and basin-level decision makers use it to trigger drought responses, ideally along with other more local indicators of drought.

How does drought affect the country?
Drought is a normal part of the climate cycle. It is a slow-moving hazard, which causes people to underestimate the damage it can do, but losses from drought are as substantial as those from hurricanes, tornadoes and other fast-moving disasters. Drought causes losses to agriculture, affects domestic water supply, energy production, public health, and wildlife, and contributes to wildfire, to name a few of its effects.
No single federal agency is in charge of water or drought policy; response and mitigation fall to an assortment of federal authorities. The USDA leads response efforts; NOAA, through the National Integrated Drought Information System (NIDIS, online at drought.gov), leads monitoring; agencies such as the U.S. Geological Survey and NASA contribute data; and the Environmental Protection Agency regulates water quality. The National Drought Resilience Partnership, launched in the aftermath of widespread drought in 2012, is an effort to unify federal drought response and policy. Drought response efforts, planning, and water law vary from state to state.

How do we know when we're in a drought?
Recognizing drought before it intensifies can reduce impacts and save money. How you recognize it depends on how it affects you. Traditional ways to measure drought are by comparing observed precipitation with what's normal (climatologic), by comparing soil moisture and crop conditions with what's normal (agricultural), or by looking at how much water is contained in snow, the level or flow rate of moving water, water in reservoirs, or groundwater levels (hydrologic). NDMC recommends that decision makers adopt an operational definition of drought for their own circumstances, incorporating local data such as gauging conditions or streamflow at a nearby gauge.

Who draws the map?
Eleven authors, from the NDMC, NOAA and USDA, create the map. They take turns, usually two weeks at a time.

How do they figure out where drought is and how bad it is?
This is what makes the U.S. Drought Monitor unique. It is not a model. The USDM relies on experts to synthesize the best available data from multiple sources and work with local observers to localize the information as much as possible. Numeric inputs are many: the Palmer Drought Severity Index, the Standardized Precipitation Index, and other climatological inputs; the Keetch-Byram Drought Index for fire; satellite-based assessments of vegetation health, and various indicators of soil moisture from data assimilation systems and other models; and hydrologic data, particularly in the West, such as the Surface Water Supply Index and snowpack.
The agencies listed are a snapshot of all of those involved. Drought.gov has links to many of these sources, where you can view the types of information that help the author create the map.

What is the process?
Thursday, Friday and over the weekend: Warmup. The author of the next week's map starts coming up to speed on the indicators, areas that are changing and any issues of concern that have carried over from the prior week(s).
Close of business Monday: The author emails a first draft of the map to the 350 observers across the country.
8 a.m. Eastern time Tuesday: Data cutoff. Condition changes after this point in time do not affect the map to be released two days later on Thursday.
Tuesday: The author fields reactions from dozens of email messages, several conference calls and other helpful contacts. Draft 2 of the map incorporates much of this information.
Wednesday: Author sends out a near-final draft of the map to the observers by lunchtime for review. A final map goes out by late afternoon to ensure there are no errors. Then the author writes a narrative for each region, highlighting the past week's weather, impacts and changes to the map. Before the author can go home, final files must be at the NDMC for processing.
8:30 a.m. Eastern time Thursday: The map is released.

Do you ever release the map early?
The map is released early the week of Thanksgiving and other weeks when federal holidays affect the production schedule. Otherwise the authors stick to the schedule.

These maps show the U.S. Drought Monitor published Thursday, Oct. 23, 2014, using data from Oct. 14-21. The black lines define areas of short- and long-term drought, indicated by the letters "S" and "L." In general, short-term drought is a recent

USDM Next Steps

- Continue *interactions* with local drought task forces, *State Climate Offices*, WFOs/RFCs, Regional Climate Centers, *University Extension* agents, *USDA Climate Hubs + field offices*
 - Foster new basin/state interactions
 - NIDIS RDEWS basin briefings/outlooks...more coming?
- Continue to evolve...encourage and incorporate *new/enhanced/innovative products via GIS and cloud environs*:
 - Transition to ACIS gridded SPI-SPEI/sc-PDSI
 - *COMING IN 2018: Operational Gridded Objective Indice Blends + new regional/seasonal/thematic blends (e.g., flash, snow, forest)*
 - Augment with more emerging satellite products (e.g., *ET-based: ESI, EDDI, QuickDRI, relative humidity, vapor pressure deficit*)
 - NLDAS, Composite Drought Indices, Soil Moisture
 - *“Uber” Drought DSS-Tool prototype*
 - *Centralized Author “ESRI cloud environment” with USDM list serve interface*
- USDM Tutorials available: http://drought.unl.edu/archive/Tutorials/USDM_Tutorial/
- New *“potential impacts”* tables being developed for each state based upon data collected in the Drought Impact Reporter (DIR)
- Integrate *U.S. Virgin Islands* (and *USAPI*)?

Thank You! Any Questions?



DROUGHT.UNL.EDU

e | ndmc@unl.edu

f /NationalDroughtMitigationCenter

@droughtcenter

Mark Svoboda
msvoboda2@unl.edu
402-472-8238

